DOCUMENT RESUME

ED 054 048 24 SP 005 137

TITLE	EPDA: The Stanford Institute on Teaching for Reflective Thinking. Directors Report.
INSTITUTION	Stanford Univ., Calif.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C.
BUREAU NO	BR-4-1652
PUB DATE	71
GRANT	OEG-0-9-141652-1816-725
NOTE	151p.
EDRS PRICE	EDRS Price MF-$0.65 HC-$6.58
DESCRIPTORS	Classroom Observation Techniques, *Decision Making Skills, Effective Teaching, *Elementary School Teachers, Information Seeking, *Inservice Teacher Education, Logical Thinking, *Problem Solving, Student Ability, Teacher Workshops, *Teaching Techniques
IDENTIFIERS	Uncertainty Studies Project

ABSTRACT

The Institute was 1) to provide a group of 13 experienced teachers with techniques for teaching elementary school students to recognize and define problems, and 2) to work closely with these teachers, evaluating the effectiveness of their teaching techniques over a period of 1 year. A series of workshops used reading, films, discussion, and microteaching to develop the following concepts and skills: generation of warranted uncertainty, generation of alternative responses to a given problem, ability to ask questions, use of nonverbal techniques to promote warranted uncertainty in others, ability to distinguish between fact and inference, and strategies for teaching these concepts and skills to children. Evaluation of the institute by participants was very favorable. Several research projects being carried out in cooperation with the Uncertainty Studies Project involve the development of an observation instrument to measure the use of warranted uncertainty techniques by teachers, an analysis of the effectiveness of different teaching styles using warranted uncertainty techniques, and a determination of the correlates and predictors of elementary school students' ability to generate warranted uncertainty. Appendixes contain a list of participants, a schedule, copies of handouts that accompanied teaching demonstrations, an initial version of the observation instrument, and copies of tests of warranted uncertainty taken by elementary school students. (RT)

ED054048

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DIRECTORS REPORT

EPDA: THE STANFORD INSTITUTE ON TEACHING FOR REFLECTIVE THINKING

June 23, 1969 to March 28, 1970

Director: Joan Sieber Suppes, Assistant Professor
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Grant OEG-0-9-141652-1816-725
Project No. 141652
Funding Period: December 6, 1968 to December 31, 1970

SP005137

I. INTRODUCTION

The purpose of the Institute on Teaching for Reflective Thinking was 1) to provide a group of teachers with techniques for teaching elementary-school students to recognize and define problems, and 2) to work closely with these teachers, evaluating the effectiveness of their teaching techniques over a period of one year. This Institute was part of a larger project which was jointly funded by the Education Professions Development Act and the Stanford Center for Research and Development in Teaching. The project had as its objectives the training of teachers, and the development and evaluation of curricula designed to enhance problem-recognition skills.

Why was this Institute concerned with teaching problem recognition skills? Presumably "discovery learning" and "inquiry training" curricula have also been concerned with teaching students to recognize problems, as well as to generate hypotheses, reason out the implication of these hypotheses, and test them against experience. (This entire sequence--problem finding, plus solution finding and testing--is usually called problem solving). However, in most curricula that are oriented toward problem solving or discovery learning, only lip service is given to the development of problem-finding skills: The teachers' manuals accompanying such curriculum often stress the importance of teaching problem-recognition skills. However, the actual curriculum materials usually consist of clearly defined problems. Problems are not presented in such a manner that students are required to discover for themselves what is unknown. For example:

> The student is given a test-tube filled with water. The student is instructed to put his thumb over the mouth of the tube, then to put the mouth of the tube under the water and take his thumb away. He is asked to explain why the water does not run out of the tube (Brandwein, Cooper, Blackwood, & Hond, 1967, p. 114).
>
> Students are instructed to look at a map of an airport and to notice the arrow on the map (north is written at the top of the arrow). Students are asked: "Does the longest runway run north and south or east and west?" (Barrows, Parker, & Sorensen, 1967, p. 5).

Emphasis in these problem-solving activities is placed on the generation of hypotheses and evaluating the hypotheses. In these actual curriculum tasks, the initial stage of the problem-solving process is omitted.

Published materials are not the only educational media that present problems in an explicitly defined fasion, giving students no opportunity to discriminate for themselves when there is a problem, an unknown, or a reason to feel uncertain. Bellack, Kliebard, Hyman and Smith (1966) have observed that teachers usually provide students with specific information and then expect specific "right" answers to questions about that information. Children hunt for cues as to what answer the teacher expects. Children's responses take on an "instinctual" quality of giving the "right" answer (Henry, 1957). Bruner (1965) has remarked that children seem to perceive teachers as wanting them to remember things or do things at a certain time and in a certain way.

There is evidence that teachers do not often entertain questioning interruptions from students. For example, Bellack _et al_. (1966) observed in a study of pupil-teacher interaction in high school that teachers initiate teaching cycles of verbal activity 40% of the time, teachers ask 80% of all the questions, and 65% of all student answers are in the form of simple answers.

Lacking opportunities to question when uncertainty is warranted can be detrimental to future learning. Luchens (1942) studied the relationship between the extent to which teachers expect correct and unquestioning responses and the problem-solving skills of their students. It was found that students of teachers who expected correct and unquestioning responses expressed surprise and indignation when instructed to use another method of solving problems than the one that had been taught explicitly.

The present lack of curriculum designed for teaching students to recognize when it is warranted to be uncertain is not surprising. There has been little research on this problem, hence the way in which individuals enter the initial stage of the problem-solving process is not understood. This problem is compounded by a strong social stigma among teachers and students against raising problematic issues or stating that one does not know the answer to a question. In a classroom study, elementary-school children were given a set of problems to which there were no known answers. Students were called upon to respond to the problems. Every child who answered said that he was certain that he was correct. The children were eager to volunteer answers, but no child admitted to uncertainty (Sieber, 1969). In another study that has not been published, children were asked to give some response to a series of questions that had ostensibly been received from other children. On encountering questions that called for a "don't know" response, over one-fourth of the subjects stated that the questions looked easy, but were very hard to answer. Some children made comments such as "I don't know the answer, but I've got to make up something so I don't look stupid." Several children refused to give any answer to the "don't know" questions. They sat silently staring at the wall. Likewise, of a group of elementary-school teachers interviewed by the staff of this project, none reported ever purposely asking their class questions to which they themselves could not answer. Also, none of the teachers reported answering students' questions with the statement, "I don't know."

In an attempt to overcome these problems, the present training and research program was designed 1) to acquaint teachers with the concept of warranted uncertainty in relation to problem solving and intellectual curiosity, 2) to interest teachers in learning to promote in students the ability to recognize when it is warranted to be uncertain, 3) to evaluate new curriculum designed to teach students to generate warranted uncertainty, and 4) to study the determinants of children's ability to generate warranted uncertainty.

II. OPERATION OF THE PROGRAM

1. Planning

The Stanford Institute on Teaching for Reflective Thinking drew on various intellectual and technological resources of the Stanford Center for Research and Development in Teaching and the Stanford University School of Education.

The conceptual basis for the Institute was derived from prior research on the relation between warranted uncertainty and decision-making skills conducted by the principal investigator and Stanford doctoral students. A bibliography of this research appears in Appendix A, along with a list of the research and development products now being completed as a result of the Institute.

The staff of the Institute consisted of Stanford students. Because of their teaching experience and intellectual background these students were well prepared to assist in designing Institute-relevant curriculum in the areas of social studies, mathematics, science, and art. Their professional interests include the use of role playing in the classroom, techniques of nonverbal communication, and methods of assessing skills which were of central importance to this project, as well as modifying pupil-teacher interaction patterns.

The Uncertainty Studies Project, a program within the Stanford Center for Research and Development in Teaching, became affiliated with the Institute on Teaching for Reflective Thinking. Through the Uncertainty Studies Project, a number of carefully controlled teaching experiments were developed in cooperation with the Institute's program and participants. While the Institute had as its primary aim the design and dissemination of teaching techniques and materials that promote warranted uncertainty, the Uncertainty Studies Program had as its aim the exploration of the psychological construct of ability to generate warranted uncertainty. In addition to the teaching experiments, a detailed set of studies of the relation between certain demographic variables (age, socio-economic class, IQ, ethnicity, family size, birth order, sex, grade level, and scores on related tests of warranted uncertainty) and ability to generate warranted uncertainty, were planned and carried out.

The Institute also utilized the microteaching technology of the Stanford University School of Education.

It was initially intended that the Institute would extend over three periods: June 23 to July 3, 1969; August 18 to 28, 1969, and March 30 to April 3. It was understood by participants that they would provide similar workshops for teachers in their own schools the following summer, or at some other appropriate time.

However, the teacher-training schedule as well as the research schedule, was modified somewhat in the course of the program. The schedule of the Institute was altered by substituting a series of evening and Saturday workshops for the March 30 to April 3, 1970 workshop, as requested by the participating teachers. The funding period was extended from May 31, 1970, to December 31, 1970, in order to permit the staff to continue its working relationship with teachers with whom teaching experiments had been begun. Finally, the plan that each participating teacher would give a workshop during the summer was abandoned in view of the fact that most teachers felt unprepared to assume leadership of such programs. Instead, a series of teaching experiments carried out in various local schools was designed to include other teachers who wished to gain some of the skills that were disseminated in the workshop. As a result, additional training was provided but with more assistance from the Institute staff than had initially been planned.

By combining the staffing resources of the Uncertainty Studies project and the EPDA Institute, and by including some non-paid graduate student assistants who wished to participate for their own edification, a total staff of nine members was developed. Only three of these assistants were employed under the EPDA contract. This large staff turned out to be quite essential. The Institute was designed to modify the norms of classroom conduct, requiring that teachers and students learn to avoid making dogmatic claims, and learn to live with uncertainty when it cannot, with intellectual honesty, be avoided. So radical a change cannot be made unless teachers are given a great deal of individual assistance. To a greater degree than we had anticipated, most of the participants in the Institute were unprepared to accept two major premises on which the Institute was based: 1) that there exists a proportionately large number of problems in which a determinate answer is not known, 2) and that acknowledgement and exploration of indeterminate problems is beneficial to the intellectual development of students. A variety of approaches, developed in the workshop and in the staff's continuing relationship with the teachers throughout the following year and a half, were required to convey these concepts to the participants.

The Institute was intended to develop several related concepts and skills: 1) discrimination between problems whose answers are known and problems whose answers are not known, 2) generation of various alternative responses to a given problem, 3) assessment of the correctness of one's own factual knowledge, 4) acceptance and use of points of view other than one's own, 5) ability to ask questions, 6) use of nonverbal techniques to promote warranted uncertainty in others, 7) ability to distinguish between fact and inference, and 8) strategies for teaching these concepts and skills to children.

The sessions during the first four weeks of the Institute were designed to develop these concepts and skills in teachers, to demonstrate their uses in various curriculum areas, and to give teachers an opportunity to modify their own school's curricula to include these concepts. The purpose of the continuing year-long relationship was to evaluate the effectiveness of the teaching skills, and to work with teachers as they encountered problems in utilizing these skills. Because of the intended workshop format of the Institute, and because the staff believed that curriculum ideas would need to be tailored to the needs and abilities of individual teachers, fully developed and explicit curriculum plans were not presented. Instead, participants were expected to adapt the presented concepts and strategies to their own needs. However, only two of the participants in the workshop gave evidence of having fully understood these concepts to such an extent that they could creatively apply them to their own curricula. Thus, the kind of workshop participation we had anticipated did not fully materialize. Rather, most of the participants tended to use, without modification, the sample lessons that were presented. During the following year and a half, teaching experiments were conducted at the participants' schools. Teachers participating in these experiments were given fully explicit lesson plans and day-to-day counseling on problems they encountered in teaching these lessons. Under these conditions, the teachers carried out the aims of the Institute successfully and enthusiastically.

Knowing what we now know about the inability of most teachers to adapt their curriculum to new concepts, we would radically modify our approach if we were to conduct a second institute. We would have begun not in the summer but in the spring, as an in-service program in which teachers would be expected to try each new approach with their own students immediately after each workshop session. Apparently, most students are far more readily excited and challenged than teachers by approaches to learning that involve problem recognition and the explanation and analysis of problematic issues. In the absence of direct experience with children, most teachers seem unprepared to believe that there can be any educational benefits from other than factual learning experiences.

We would develop separate units for teaching each of the skills listed on page 6. These units would be made available to the teachers, one by one; a new unit would not be issued until the prior one had been used in class and was fully understood. We would use our videotaping resources to tape the classroom performance of especially successful teachers for replay and analysis in subsequent workshop meetings. (As it was, our videotaping of microteaching, rather than regular classoom experiences, seemed to evoke more self-consciousness than learning in our participants. Those most in need of improvement in the use of the concepts taught in the workshop were least able, of course, to perform well in the videotaped sessions, or to evaluate their performance.) Quite possibly, we would also use a "revolving internship" in which teachers would have an opportunity to visit one another during school hours, to observe the use of specific techniques and to assist one another.

2. Participants

Since the Institute was to involve a continuing relationship between Institute staff and participants, participants were drawn from within a 25-mile radius of Stanford University. The selection procedure was designed to attract experienced and capable teachers who could relate new teaching concepts to their existing teaching practice. All applicants were required to have at least two years of experience in elementary-school teaching. We attempted to obtain a group of racially mixed participants. Unfortunately, we had only two Black applicants, and after the first week one was forced to drop the program because of other academic commitments during summer school. However, the ethnic and socioeconomic class background of students was widely varied in the schools represented.

A list of the participants in the Institute is contained in Appendix B.

3. Staff

Members of the Institute staff were as follows:

Bette Acuff (EPDA supported) received her BA in elementary education from Stanford in 1950 and is currently a doctoral student in art education. She has fifteen years of teaching experience in schools in California, Arizona, England and France. Her teaching experience at the elementary level has included grades K through 6, with the exception of 1st and 3rd grades. She has eight years of art teaching experience at the junior high level, and English as a foreign language to French children. Other experience includes social work and directing arts and crafts programs for children of all ages.

Marilyn Epstein (consultant) had just completed her freshman year at Stanford, during which she took a freshman research seminar from Joan Sieber (Suppes). She subsequently worked on an experiment validating a procedure for teaching fifth-grade children objective uncertainty. She is especially interested in the differences in reception of our training procedure in relation to racial and class differences among the students.

Chandrakala Dhar (Research and Development Center Research Assistant) has taught courses in advanced education research methods and supervised teacher-training performance. She is currently a doctoral student in the Psychological Studies program in Education at Stanford.

Theodore Feely (EPDA supported) received a bachelor's degree in political science from Stanford, and a master's degree in the same field from the University of Chicago. He taught English in Thailand for two years, and was an assistant supervisor for elementary English education in Nonthaburi Province. Upon returning to the United States, Ted taught 9th- and 11th-grade social studies in Miami. For the past one and one-half years he has been supervising social studies interns in the Stanford STEP program. His professional interests lie in the areas of curriculum and instruction research.

Jana Floyd (R & D Research Assistant), a doctoral student in Psychological Studies at Stanford, is interested in nonverbal interaction between teachers and students, and in testing emotional and social attitudes of teachers and students in connection with uncertainty training. She studied child development at Cornell and University of Michigan, and has taught in elementary schools for five years. She also supervised student teachers and nursery school teachers for one year. She is currently developing attitude questionnaires for parents, students, and teachers in a research project for a public school district.

Douglas Jacobs (consultant) had just completed his freshman year at Stanford University. He became involved in Reflective Thinking as a technique for education in a freshman seminar at Stanford. While working with the seminar and through individual work, he helped to develop and test reflective thinking curriculum at the 4th- and 5th-grade levels.

Helen McCullough (consultant) is a graduate of the School of Secondary Education, Tuskegee Institute in Alabama, with a major in chemistry and minor in mathematics. She taught junior high school mathematics, entering the Stanford doctoral program in Mathematics Education. Graduate work here is focused on developing mathematics curricula that will be effective with inner-city children. Helen is currently a research assistant with the School of Mathematics Study Group.

Joan Sieber (Suppes) received her Ph.D. in Psychology at the University of Delaware and is now Assistant Professor of Education at Stanford and a Research and Development Associate at the Stanford Center for Research and Development in Teaching. She has taught in elementary school. She is interested in problems of intellectual and social development. Most of her research is on decision-making and problem-solving skills of children and adults. She teaches courses in Early Learning, Middle Childhood, Child Development and Individual Differences in Cognitive Processes at Stanford.

Louis Weiss (consultant) received a M. A. degree in linguistics from Stanford University in 1967, and is now a doctoral candidate in foreign language education. He formerly taught high school French, and has served as a member of the instructional staff at the University of Oregon NDEA Summer Institute at Tours, France.

Rick Bale (volunteer) is a doctoral student in counseling psychology. His participation in the running of the summer meetings of the Institute was an outgrowth of his interest in teachers' modes of adapting to new innovations.

Jane Stallings (consultant) is a doctoral student in curriculum and instruction at Stanford University. She has had many years of elementary-school teaching experience and is particularly interested in problems of adapting instructional approaches to meet the intellectual and social needs of children.

4. Program Operations

The Institute meetings during the summer were held on the Stanford campus daily from 9 AM until 3 PM, and consisted of a widely varied program. A copy of the schedule for the first week of the Institute is contained in Appendix D. This schedule gives some sense of the approaches utilized.

Two days of the Institute were devoted to developing concepts of unwarranted uncertainty. Teachers were taught to conceive of problem solving in terms of four possibilities, relating to whether the problem solver feels certain of a response, and whether he has the correct answer:

a) The problem solver may act with certainty to make an adaptive (correct) response. In a sense, this does not constitute a problem situation since a means for immediate solution to the problem occurred to him.

b) He may react with a maladaptive certainty response, i.e., he may feel certain that he has a correct reponse although he is incorrect.

c) He may be inappropriately uncertain, i.e., he may have a correct response but feel uncertain about whether it is correct.

d) He may react with warranted uncertainty, recognizing that he must choose between various mutually exclusive alternatives. A number of exercises were carried out in which participants responded to problems and then analyzed which problem-solving state they were in (and which state they should have been in).

Following this introduction, a variety of activities were conducted that are relevant to understanding how persons may function effectively under conditions of uncertainty. For example:

a) Some essays on the nature of reflective thinking and effective problem solving (personal and otherwise) were read and discussed. These included a discussion by Overstreet on learning to think, from The Mature Mind, and an article by I. A. Richards, entitled "Feed Forward," from The Saturday Review, February 3, 1968.

b) The movie "Let Us Teach Guessing," was shown. This movie demonstrates the teaching methods of the mathematician, George Polya. Polya stresses the importance of creating hypotheses when one has no clear answer to a problem.

c) Several sample lessons were taught by staff members; the participants of the Institute served as pupils. Each lesson was designed to exemplify the use of one or more of the concepts listed on page 7. (A sample of the handouts that accompanied these lessons is contained in Appendix E.)

d) There was also a series of lessons and exercises concerning verbal and non-verbal techniques for creating warranted uncertainty in classroom situations, as summarized in Appendix F.

e) A workshop was held on the use of role-playing techniques appropriate for teaching students to explore problems, generate hypotheses, and recognize and use perspectives other than their own. The textbook Role-Playing for Social Values: Decision Making in the Social Studies, Shaftel, George, and Shaftel, Fanny. Englewood Cliffs: Prentice-Hall, 1967, was used as the reference book for this purpose.

f) A number of evaluation procedures for assessing students' ability to generate warranted uncertainty were introduced at the Institute. Some of these same instruments were used later to evaluate the skills of Institute participants' students. Examples of some of these evaluation procedures and instruments are shown in Appendix G.

The success of this Institute seemed to depend on the staff's ability to persuade participants to express their questions and anxieties about the techniques that were introduced. On the morning of the third day of the Institute, the staff observed that some of the participants were lingering outside of the meeting-room door. It was learned that they were sceptical about the ideas being presented, and that they were debating among themselves whether to give the Institute "one more chance," or return home for good. The staff persuaded them to come in, and devoted the session to a discussion of their questions and problems. What was disconcerting was the great difficulty of getting participants to articulate their questions. Thereafter, one of the members of our Institute devoted a major portion of his time to socializing with whatever group or individuals appeared troubled or taciturn. Our staff meetings at the end of each day were devoted to discussing the problems that each staff member was able to sense and to developing opening topics for the next day in which we aired those problems, rather than requiring the participants to articulate them. This seemed to provide a great sense of relief to participants. Apparently, by this technique, we alleviated many of their fears and assured them that we understood their perspectives, although ours were somewhat different.

The Institute was scheduled for three sessions: early summer, late summer and the following spring. When participants arrived at the first session, immediately after school had let out for the summer, they were physically and emotionally exhausted. The first two weeks of the workshop were difficult, mostly, it appeared, because of the newness of the concepts and the psychological state of the participants. The staff was astounded to see how much more relaxed and youthful the participants looked when they returned to the workshop in August. Their improved physical and psychological condition, coupled with the opportunity they had had to think over the concepts gained in the June and July sessions of the workshop made the second session much easier. There was wide-spread acceptance of the concepts, a willingness to practice them in microteaching sessions, and enthusiasm for adapting the techniques presented in the Institute to their regular curriculum. (Unfortunately, however, it was quite clear that this latter task was too difficult for most of the participants). The final session was altered at participant's request to consist of a series of evening and Saturday meetings. These were the most cordial and relaxed of all. There was an open sharing of problems and achievements. Thus, it appeared that a one-session Institute would have served no useful purpose.

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5. Evaluation

This section will be divided into three parts. The first part is the report of an evaluation of the Institute by the participants shown in Tables 1 through 3, which follow. The second part describes preliminary results of research performed to evaluate the performance of teachers who participated in the Institute and of their students in relation to control classes. The third part provides a preliminary report on some teaching experiments that were carried out by the staff in collaboration with the Institute participants during the school year following the summer Institute sessions.

Part 1.

TABLE 1

Participants' Evaluation of the Effects of the 1969 Institute on Teaching for Reflective Thinking on Their Attitudes Towards Thinking

Question	$\bar{X}$	S.D.	Rating Scale
1. My teaching methods have been altered.	3.3	1.1	1-substantially 4-somewhat 7-not at all
2. I have learned valuable teaching techniques	3.1	1.2	1-many 4-some 7-none
3. I have changed my ideas of the role of teaching.	4.25	1.1	1-substantially 4-somewhat 7-not at all
4. I can use warranted uncertainty	2.8	0.4	1-all the time 4-sometimes 7-not at all
5. I can use warranted uncertainty for special projects.	2.7	1.1	1-all the time 4-sometimes 7-not at all
6. I will be able to model uncertainty with the students.	2.25	1.1	1-often 4-sometimes 7-not at all
7. I will be able to let the students figure out answers to questions.	2.5	0.8	1-all of the time 4-sometimes 7-not at all
8. The amount of time per school day that should be spent teaching-ing for, or using, warranted uncertainty.	.48	0.2	
9. The amount of time I expect to spend teaching the use of warranted uncertainty.	.40	0.2	

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TABLE 2

Teachers' Feelings About Using the Approaches Developed in the Institute on Teaching for Reflective Thinking

Question	$\bar{X}$	S.D.	Rating Scale
1. How do you feel about using warranted uncertainty in your classroom?	2.2	1.1	1-relaxed 5-not relaxed
2. Do you have clear ideas how to produce warranted uncertainty?	2.4	0.5	1-clear 5-unclear
3. Are you comfortable about teaching with the whole class for warranted uncertainty?	1.8	0.9	1-comfortable 5-uncomfortable
4. Are you comfortable about teaching for warranted uncertainty with small groups?	1.75	1.0	1-comfortable 5-uncomfortable
5. Do you feel comfortable about using the kinds of verbal techniques developed in this Institute?	2.5	0.5	1-sure 5-unsure
6. Do you feel sureness about using the kinds of nonverbal techniques developed in this Institute?	2.4	0.5	1-sure 5-unsure
7. Do you have clear ideas about how to use warranted uncertainty in the regular curriculum?	2.9	0.7	1-clear 5-don't know
8. Do you have ideas as to what student responses warranted uncertainty will encourage?	2.6	0.7	1-clear 5-don't know
9. Do you have ideas about how to elicit student responses?	2.7	0.5	1-clear 5-don't know
10. What kinds of questions will you ask?	3.1	0.7	1-know 5-don't know
11. What lessons will you teach this way	2.2	0.8	1-know 2-don't know

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TABLE 3

Teachers Responses to Questions

Teacher	A. Can reflective thinking be justified as an educational tool? How? How does warranted uncertainty contribute to reflective thinking?
B.A.	Yes, it allows you to evaluate what is presented. Warranted uncertainty gives the technique.
J. B.	Yes, it's a different approach which seems to be more meaningful. It offers alternatives.
L. G.	Any technique that will help children learn to think is worth trying. Warranted uncertainty gives students the impetus to think reflectively.
B. H.	Yes. It engenders the ability to think creatively and to see alternative solutions to some problems. It also increases the perceptions of individuals so that they can discover that some problems have no answer. Reflective thinking is an ability that is conducive for operating in our ever-changing world. Warranted uncertainty contributes to reflective thinking in that it helps the individual realize the open-endedness of many situations.
L. J.	A person must be uncertain before he can consider other hypotheses and think reflectively.
J. K.	Yes, because the objective in education should be to encourage children to think. It definitely requires a great deal of thinking and the realization that not all questions are answerable.
E. M.	Very definitely: 1) By examining the amount and quality of interest generated in pupils. 2) Increased ability to engage in depth of the amount and quality of interest generated in pupils. 3) Perseverance of interest as shown in desire to research, etc., . . . creates the need for reflective thinking.
J. M.	Yes, both as a motivator and as a thinking skill. Uncertainty should make students more open and able to evaluate alternative hypotheses, in addition to generating more hypotheses.
G. S.	Certainly--it gets children to question their world and not accept blindly anything they are told. When you are uncertain, you start thinking reflectively.
R. W.	How could a man be educated and not be a reflective thinker?
D.	I'd like to reserve my judgment until I have used these techniques in depth.

B. How would you use cue attendance in teaching warranted uncertainty?

B. A.	Have children draw evidence from experiments, maps, pictures, paragraphs, objects--rather than teacher indicating, and from these allowing hypothesis generation--seeing many possible answers.
J. B.	Art, spelling, math, reading.
L. G.	Leading students to truly observe. Helping them be specific in their observations and to be able to verbalize. Particularly interesting, I believe, in science and social studies.
B. H.	I would use this method by encouraging students to use visual observations and make use of motivating experiences; by listening to stories for role playing. These ways of using cue attendance would be valuable in social studies, science, and art.
L. J.	I would use cue attendance in teaching warranted uncertainty in social studies and sciences.
L. J.	I would teach warranted uncertainty by means of pictures, maps, objects, as a lead-up to hypothesis generation. My picture techniques would be by use of art reproductions, and Shaftel-type role playing.
E. M.	Cue attendance could be used in teaching warranted uncertainty in science, history, current events, geography, reading-literature, art appreciation, music and math.
J. M.	I would use cue attendance in teaching warranted uncertainty in literature, art, music, and science, so that children would be more aware of possibilities and complexities.
G. S.	In art I would use pictures; in science, observations and experiments; in social studies pictures and stories of other civilizations.
D.	To teach warranted uncertainty by cue attendance, I would make use of pictures, models, posters, and objects.

C. How would you use modeling in teaching warranted uncertainty?

B. A.	I do not believe this is valid. You are teaching a technique, not thinking.
J. B.	Possibly in all subjects?
L. G.	There is nothing new to me here; I feel that this has been part of my teaching.

C. Continued--How would you use modeling in teaching warranted uncertainty?

B. H.	I would use modeling in teaching warranted uncertainty by being an example--indicating to the students by saying, "I don't know."
L. J.	I would use modeling in teaching warranted uncertainty by being an example--indicating to the students by being honest, relaxed, and unthreatening all day.
J. K.	When I am asked a question which I either cannot answer, or am not sure of the answer, I will tell the student so, try to indicate why, and perhaps suggest ways to find out.
L.	I would use modeling by saying, "We are going to play a game. Someone will show you how to answer." Also we could use, "Ask me a question I can't answer."
M.	I would use modeling in science, history, current events, geography, reading-literature, art appreciation, music, and math.
J. M.	I would use modeling to encourage use of witholding judgment, listening carefully, seeking further information.
G. S.	I don't think I'm going to use this unless it's with myself.
D.	When a lesson lends itself to the teaching of warranted uncertainty, I will go through a sample problem to give the students an idea of what is expected of them.

D. How would you use an underlining technique in teaching warranted uncertainty?

B. A.	I would use this technique in spelling, definitions, factual information, factual information, mathematics facts, and in hypothesis generation.
J. B.	I'd use this method in spelling and math.
G.	This technique would be useful in spelling, reading, vocabulary, and possibly English. Will focus work on what they individually don't know.
B. H.	By having students do this to items they are not sure of, I would use the technique.
L. J.	I would use it in teaching creative writing.
J. K.	I would use this method in spelling tests, composition, and maybe in math.
L.	I would use the spelling techniques once a day--ten words--until they caught on.
E. M.	I will use it in teaching science, history, current events, geography, reading-literature, art appreciation, music, and math.

D. Continued--How would you use an underlining technique in teaching warranted uncertainty?

J. M.	I will use it especially in spelling and composition.
G. S.	I intend to use it.
D.	I could use this technique when I wanted the students to indicate unsure written responses.

E. How would you use an uncertainty scale in teaching warranted uncertainty?

B. A.	I will be experimenting with this, as I am not yet sure what areas it will be best in--perhaps social studies and science exams.
J. B.	I'll use this in all subjects.
L. G.	This has limited use in the beginning of the year, but I'll use it after students have grasped hypothesis generation.
L. J.	Basically, I intend to use this tool a great deal in the Social Studies and sciences. These are two areas I most want to improve next year, and this will be a great asset.
J. K.	I will design tests specifically for the purpose of introducing the scale where various answers are offered by the students, and then rated. This can be used wherever feasible, especially after hypothesis generation.
L.	I'll use this on most questions.
E. M.	I'll use this technique in science, history, current events, geography, reading-literature, art appreciation, music and math.
J. M.	I'll use this in science and social studies essay tests.
D.	Students could use this scale to indicate how sure their response is.

F. How would you use "grouping ideas into categories" in teaching warranted uncertainty?

B. A.	I plan to use this along with cue attendance in all curriculum areas. I see great validity in these learning methods for children facing a rapidly changing world.
J. B.	I'll use this technique in teaching science and social studies.
L. G.	Should be used as a follow-up activity after an experience. List things known, and unknown.

F. Continued--How would you use "grouping ideas into categories" in teaching warranted uncertainty?

L. J. A great deal in social studies and science.

J. K. This will be especially useful when ambiguous ideas have been offered, so the students can categorize before and after information has been gathered.

L. I can use this with art reproductions and nonsense stories.

E. M. I'll use this in teaching science, history, current events, geography, reading-literature, art appreciation, music and math.

J. M. This should be used frequently and in all areas.

D. This could be used to determine how sure one could be of a particular answer.

G. How would you use students' "don't know" responses in teaching warranted uncertainty?

B. A. I'd use this only in areas where factual knowledge has not been made a requirement.

J. B. I'd use this in all subject areas.

L. G. I intend to use this in science and social studies, and if it proves, successful, in other areas.

B. H. I would create a climate of acceptance for this response, and ask the student why he didn't know how to increase his depth of understanding to help him discover other ways of finding information.

J. K. I would get students to realize that there are reasons for not knowing, and I would try to get them to state why they didn't know answers for specific questions. Even further than that, I would try to get each student to state where and how they could find the answer.

L. I want to do this in all subject areas.

E. M. I would use this in science, history, current events, geography, reading-literature, art appreciation, music, and math.

J. M. I would use this frequently in all areas.

D. I will encourage a "don't know" answer when the child actually does not know.

Note: Several of the participants did not answer all of the questions, indicating that they did not yet feel familiar enough with the procedures to give a definite answer.

Part 2

The behavior of teachers who participated in the Institute, behavior of 35 control-group teachers, and of the respective students, was studied in various ways. Videotapes of teacher behavior were obtained and analyzed through a system of coding teacher and pupil behavior. This coding system was developed by the project research staff. A manual describing the system, its validity and reliability and use will be completed soon, and disseminated through the Stanford Center for Research and Development in Teaching, and the ERIC System. The system was developed to examine the extent to which teachers and pupils generate uncertainty in classroom discussions.

In the videotaping study, teachers were asked to teach under four different conditions, designed to control a set of potentially compounding variables, and to study systematically those aspects of teacher and student behavior of interest to the project. Each teacher was required to participate in the following four 20-minute videotaped lessons:

1) The teacher was to conduct a free discussion according to his own wishes, based on an SRA science film.
2) The teacher was to show an SRA science film. After showing the film, he was not to give the children information nor to direct them in any particular way. The children were to figure out the problem and to ask questions to which the teacher could give only "yes" or "no" answers.
3) The teacher was to show an SRA film. He was then to require children to develop hypotheses to explain what they had observed, while he served as secretary, writing their hypotheses on the board. He was then to help the children to develop reasons in support of their hypotheses, and to determine which were the best hypotheses.
4) The teacher was to show an SRA film. He was then to encourage the students to organize and conceptualize the information, according to his own style of teaching.

A Latin-square design was utilized, such that the sequence of the four lessons remained constant, and the four films were balanced (e.g., each film appeared once in each possible position). Time of day of lessons was held constant within teachers. A set of tests of ability to recognize when it is warranted to be uncertain was given to these students.

Analyses are now being performed to determine: 1) Teacher differences in teaching style. 2) The relationship between these differences and student performance. 3) The relation between syntatic complexity of students' verbal statements and their scores on the written tests, and the reliability of teaching styles over tasks. The products of this study will be a description of of relevant teaching styles and a research report of the study.

In addition, a series of correlational studies are being performed on the six different tests of warranted uncertainty that were administered to more than 800 fourth-, fifth-, and sixth-graders, in experimental and control groups. These data are being analyzed both to explore the construct of the ability to generate warranted uncertainty, its correlates and predictors, and also to evaluate the results of experimental-group teachers' participation in the Institute.

Part 3

Some instructional experiments, in which project research assistants served as teachers, were performed to test the effectiveness of various techniques. This procedure was used to overcome problems encountered in classroom experiments in which the teacher would need to be relied upon to supply the experimental treatments. The experiments were as follows:

a) Role-playing skills of 64 fifth-grade students in problem recognition and hypothesis generation were examined in relation to student characteristics and the characteristics of the role-playing task. The role-playing tasks were varied experimentally as to the amount of uncertainty they were designed to evoke. A coding system for describing and evaluating role-playing behavior was developed for use in the experiment, and proved to be highly reliable. The data gathered in the role-playing experiment are now in the final stages of analysis.

b) A series of units on art history was developed, along with relevant instructional methods. These units were designed to show the effects of two techniques eliciting uncertainty (cue attendance and hypothesis generation) under differing stimulus conditions. This experiment was derived from a study by Salomon and Sieber (1970. A rating schedule was designed and used to assess reflective thinking skills in art appreciation. The experiment was conducted over a six-weeks period with 128 fifth-grade students. These data are now being analyzed.

c) A training experiment based on an experiment performed by Suppes (Sieber), Epstein and Petty (1970) was completed. The purpose of the study was to investigate the effect of teaching a strategy for enhancing students' ability to recognize and express warranted uncertainty. Six classrooms were involved. There was both an experimental and a control class at the fourth- fifth- and sixth-grade level. A 3(grade level 4, 5, and 6) by 2(sex) by 2 (treatment) factorial design was employed. Each experimental subject was matched with a control subject on total Lorge-Thorndike IQ score. Each experimental subject was matched by IQ with a control subject at the same grade level. A one-month instructional program was administered, followed by a posttest and a delayed posttest of ability to recognize problems. Several demographic measures, believed to be predictive of ability to generate warranted uncertainty, were obtained. The analysis of these data is still being completed. Preliminary results indicate that the treatment was highly successful in increasing students' ability to recognize problems and to understand why they are problematic. On both the posttest and the delayed posttest, experimental students at each grade level were better at dealing with questions having determinate answers as well as those whose answers were problematic. The experimental subjects also excelled at identifying the reasons why questions were problematic. (Examples of reasons why a student may find a question problematic are:(i) the student does not know the answer, though he recognizes that there exist sources of information where it can be found; (ii) the answer is not presently known, although there exist means of discovering it; (iii) the answer is not presently known, and at present no method is known by which an answer may be obtained . These differences between experimental and control groups were all highly significant. At present, more detailed analyses are being done: Stepwise regression analyses of each posttest variable are being performed to determine the predictive power of selected demographic and skill variables. Variables which in prior analysis of uncertainty studies data have been found predictive include socio-economic class and family size. We will determine whether we can replicate thse findings in the present study.

Teacher report indicates that the treatment was highly engaging and provided students with new approaches to the analysis of problems. Students persisted in using these approaches even during the period after the first posttest and before the delayed posttest, when teachers were instructed by the experimenter not to employ the approaches and not to encourage their use by students. To our surprise and pleasure, the treatment appeared to be most successful with those students who normally seem uninvolved and who perform poorly. It appears that these conceptual tools enabled such a student to see for himself and to demonstrate to others that not knowing something is not necessarily a sign of stupidity. Apparently, these students learned to use their own analytic skills to understand both the limits of their own and of other's knowledge.

A larger-scale experiment based on this study is now being planned, and will be conducted next fall as a dissertation study by Helen Smith. In that study we will use the event-sampling system that has been developed by the Uncertainty Studies Project to examine the teaching behavior of the experimental and control teachers and the learning behavior of their respective students. In this way, we hope to gain greater insight into the effects of treatment. In addition, we will examine the effects of students' quantiative/verbal IQ ratio which, in prior studies, has been predictive of ability to generate warranted uncertainty (without special training). We will also examine pre-treatment measures of ability to generate warranted uncertainty so that we can distinguish between pre-treatment and posttreatment predictors of warranted uncertainty. Two products will be forthcoming from this experiment, a manual describing the method of training teachers to give the specified treatment, and the entire curriculum of which the treatment was comprised, and a research report on the experiment itself.

Research reports summarizing these aspects of the evaluation of the project will be available from the Stanford Center for Research on Teaching by December 31, 1971, and from the ERIC Clearing House. A list of the products that will be completed as a result of this program appears in Part 2 of Appendix A.

ED054048

APPENDIX A

Research and Development Products

1) Which formed the conceptual basis of the Stanford Institute on Teaching for Reflective Thinking

2) Which have resulted from the Institute

1. Research on which the Institute was based:

Sieber, J. E., & Lanzetta, J. T. Conflict and conceptual structure as determinants of decision-making behavior. *Journal of Personality*, 1964, *32*, 622-641.

Sieber, J. E. Problem-solving behavior of teachers as a function of conceptual structure. *Journal of Research in Science Teaching*, 1964, *2*, 64-69.

Lanzetta, J. T., & Sieber, J. E. Pre-decisional information processes: Some determinants of information acquisition prior to decision making. In *Pre-decisional processes in decision making: Proceedings of a symposium.* A.M.R.L. Technical documentary report, 1965. Pp. 125-178.

Joyce, B. R., Lamb, H. E., & Sibol, J. S.* Conceptual development and information processing: A study of teachers. *Journal of Educational Research*, 1966, *59*, 219-222. *(Sibol was my former married name)

Sieber, J. E., & Lanzetta, J. T. Some determinants of individual differences in pre-decision information processing behavior. *Journal of Personality & Social Psychology*, 1966, *4*, 561-571.

Lanzetta, J. T., & Sieber, J. E. Social psychology. In *Contemporary Approaches in Psychology*, H. Helson and W. Bevan (Eds.) Princeton: Van Nostrand, 1967, pp. 529-572.

Sieber, J. E. Lessons in uncertainty. *Elementary School Journal*, 1969, *69*, 304-312. (Also reprinted as a chapter in *Teachers and the Learning Process*. I. Strom (Ed.), Prentice-Hall, 1970.)

Sieber, J. E. A paradigm for experimental modification of the effects of test anxiety on cognitive processes. *American Educational Research Journal*, 1969, *6*, 46-61.

Salomon, G., & Sieber, J. E. Relevant subjective response uncertainty as a function of stimulus-task interaction. American Educational Research Journal, 1970, 7, 337-350.

Suppes, J. S., Epstein, M. & Petty, C. The effectiveness of modeling and concept learning procedures in teaching children to indicate uncertainty. The Irish Journal of Education, 1970, 2, 90-106.

Salomon, G., & Sieber, J. E. The interaction of communication media and two procedures of training for subjective response uncertainty. (submitted to Journal of Personality and Social Psychology)

2. Research and development products which resulted from the Institute

   a. A description of a coding system for describing objective uncertainty in student

   b. Correlates of problem finding and the expression of uncertainty in elementary-school children.

   c. A description of some styles of teaching and their implications for students' reflective-thinking ability.

   d. A manual of training teachers to teach recognition of problems and identification of reasons why answers are not known. This includes a one-month curriculum, spelled out in detail.

   e. A study of some determinants of children's ability to identify problematic situations.

   f. A procedure for using role playing to study children's decision-making behavior.

   g. A study of the determinance of children's role-playing behavior under conditions of high and low uncertainty.

   h. A procedure for coding responses to art productions.

   i. Sex differences in pupil-teacher verbal interaction.

   j. Some determinants in the rage of children's responses to art productions: A teaching experiment.

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APPENDIX B

Participants in the
Stanford Institute on Teaching For Reflective Thinking

June 23, 1969

Barbara M. Anderson 1094 Tanland Drive #102 Palo Alto, California 94303	328-2759	Whisman Elementary School Self-contained 5th grade
George E. Bratton 155 Acalanes Drive # 10 Sunnyvale, California 94086	968-5371	Los Lomitas School District Menlo Park 6th grade curriculum
Joyce F. Butkus 2759 Union Street San Francisco, California	931-7133	Ponderosa School San Francisco Self-contained 5th grade
Lois R. Green 420 James Road # 27 Palo Alto, California 94306	321-6478	Moreland School District San Jose, Calif. Self-contained 4th grade
J. Bernard Howell 757 Haight Street San Francisco, California	861-2537	Excelsior School 6th grade San Francisco Buena Vista - Non Graded Due to open in September
Lee L. Jenkins 2441 Monroe Santa Clara, California 95051	248-9357	Santa Clara Unified School District Self-contained 5th grade
Julie A. Kessler 187 Acalanes # 24 Sunnyvale, California 94086	968-9425	Sedgwick School Cupertino Union School Dist. Self-contained 5th and 6th grades
Phyllis J. Leschyn 1609 Valley View Avenue Belmont, California 94002	591-4306	Knolls School San Mateo, Calif. Self-contained 5th & 6th grades
Janis A. Lockler 2151 Camino A Los Cerros Menlo Park, California 94025	854-0230	Brentwood School East Palo Alto Self-contained 4th Grade
Elizabeth A. Morgan 859 La Pera Avenue Palo Alto, California 94306	325-8951	Whisman Elementary School Dist. Theuerkauf School Mountain View 5th and 6th Grades
Judith K Moulton 810 Polhemus Road # 42 San Mateo, California 94402	345-0353	Highlands San Mateo City School District Will teach 4th & 5th Non-graded next year

Georgina A. Stout 1190 Arlington Lane San Jose, California 95129	257-5689	Crittenden School Whisman School District Self-contained 6th Grade
Sylvia B. Valentine 980 Swan Street Foster City, California	345-8632	Runnymede School East Palo Alto All general elementary 5th & 6th Grades
Roger L. Wilson 3195 South Court Palo Alto, California	326-1486	Walter Hayes School Palo Alto 5th grade
Duane B. Zampedri 394 Dayton Avenue Santa Clara, California 95051	243-3881	Sedgwick School Cupertino Self-contained 5th Grade

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APPENDIX C

Some examples of announcements and form
letters sent out concerning the Institute

SCHOOL OF EDUCATION
STANFORD UNIVERSITY

STANFORD CENTER FOR RESEARCH AND
DEVELOPMENT IN TEACHING

770 Welch Road, Palo Alto, California 94304
Area Code 415
321-2300 ext. 4717

April 30, 1969

ED054048

Dear Sir or Madam:

Enclosed you will find announcements and applications for an Institute on "Methods of Developing Reflective Thinking in Students" to be held at Stanford University.

We would appreciate your posting the announcements. If you are interested, please discuss it with your staff. Deadline for applications is May 30, 1969.

Additional information may be obtained by calling Dr. Joan E. Sieber, Stanford University, School of Education, 321-2300, ext. 4796.

JES:hk
Encl.

EPDA INSTITUTE

Methods of Developing Reflective Thinking in Students

For Teachers: Grades 4-6

STANFORD UNIVERSITY
School of Education

A 25 Day Institute
Spreading Over Three Periods:

June 23, to July 3, 1969
August 18, to 28, 1969
March 23 to 27, 1970

GENERAL INFORMATION

This is a pilot program to which 15 applicants will be admitted. The institute will spread over three periods: June 23 to July 3, 1960 (Monday through Saturday and Monday through Thursday), and August 18 to 28, 1969 (Monday through Saturday and Monday through Thursday), and March 23 to 27, 1970 (Monday through Friday). Class will be held from 9:00 to 12:00 A.M. with individual consultation from 1:00 to 3:00 P.M. Participants should plan to participate in the entire program, including cooperation in a continuing relationship with the institute staff throughout the school year as described below. A stipend of $375.00 and a dependency allowance of $75.00 per dependent will be paid to participants. University credit will not be given for participation in this institute. This institute is sponsored by the U. S. Office of Education, Bureau of Educational Personnel Development.

Director, Joan E. Sieber, Assistant Professor

Applications may be obtained from your Principal or by writing to Dr. Joan E. Sieber, EPDA Institute, School of Education, Stanford University, Stanford, California, or telephone 321-2300, extention 4796.

APPLICATION DEADLINE: MAY 30, 1969

CRITERIA FOR ADMISSION

Only those persons will be accepted who: 1. Have at least two years teaching experience. 2. Can assure that they will continue to teach at their present school and grade level throughout the next year. 3. Are teachers in grades 4, 5, or 6. 4. Can assure that they will participate in the entire program, including mid-summer "homework" and all year cooperation with the institute staff. 5. Will direct a small inservice program for some 4th, 5th, and 6th grade teachers in their school during the year 1970-71.* 6. Be fully familiar with the cirriculum which they will be teaching next year. 7. Are willing to experiment with new approaches. 8. Are willing to relinquish the role of teacher which holds that the teacher knows the answers. (This program stresses the importance of recognizing and exploring what one does not know. It is therefore important that the teacher himself exemplify this quality.) 9. Provide a letter of recommendation from their principal.

INSTITUTE PURPOSES

The institute has two major purposes: (1) To help teachers develop reflective thinking in students, and (2) to help teachers disseminate the knowledge and skills acquired in the institute.

Developing Reflective Thinking in Students

This will include techniques for teaching students to (1) recognize and acknowledge what is not understood, (2) ask perceptive questions, (3) recognize the difference between problematic and clearly understood phenomena, and (4) develop hypothetical predictions.

---

* This will be modelled after the Stanford EPDA Institute and will be conducted with the aid of materials and consultation of the institute staff. Additional compensation for this service will be arranged on an individual basis.

For the teacher this means development of a philosophy of thinking and teaching in which openness to ideas and acknowledgement of one's own areas of ignorance are highly valued qualities. Secondly, it involves re-examination and re-arrangement of the curriculum in order to highlight problematic issues. Further it involves an awareness of the psychological underpinnings of reflective thinking not only in one's students, but in one's self, and development of specific techniques for teaching students to be reflective, both in communicating with others in group settings and individual work.

Disseminating to Colleagues Knowledge and Skills

Implementing the second purpose of the institute will involve teachers in their own schools' inservice programs. The formats of these inservice programs will depend in large part upon the institute teachers, individual situations at each teacher's school, and arrangements made with the various school districts.

INSTITUTE PROGRAM

From June 23 to July 3, (excluding Sunday, June 29) participants will become acquainted with the underlying assumptions concerning reflective thinking and the psychological basis of reflective thinking skills, including the establishment of appropriate social norms. Participants will explore ways in which their present curriculum and approaches to teaching may be revised to promote the various approaches to reflective thinking. (For example, how should material be presented so that children will recognize what they do not understand fully and why they do not understand it? How does a teacher change class norms so that children will be eager to point out what it is they do not understand and to explore why it is not understood? How may children be taught to ask perceptive questions?)

During the summer vacation, participants will rethink their own curriculum and teaching approaches. They will draw up lesson plans (covering the first month of next year's teaching) which incorporates these plans. During this time teachers should counsel freely with the institute staff about their ideas and to discuss and work out any problems they may encounter in developing their lesson plans.

From August 18 to 28, (excluding Sunday, August 24) participants will reconvene at Stanford. Participants will have an opportunity to discuss their new teaching plans. They will then practice skills of teaching for reflective thinking in a micro-teaching clinic. Plans will be made for continuing work relationship between participants and the institute staff throughout the school year.

At the beginning of the school year, the reflective thinking skills of students in the participants classes will be evaluated by the teacher and the institute staff. Throughout the school year, the institute staff will continue to consult with the teachers, observing teaching from time to time and continuing to evaluate students progress in their development of reflective thinking skills.

From March 23 to March 27 (Spring Vacation) the institute will reconvene at Stanford to evaluate the techniques that have been developed, discuss problems that have arisen in connection with the teaching approaches and plan participant's own inservice instruction of teachers in their own school during the next year.

NON-DISCRIMINATORY PROVISION

Discrimination prohibited -- Title VI of the Civil Rights Act of 1964 states: "No person in the United States shall, on the ground of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."

SCHOOL OF EDUCATION
STANFORD UNIVERSITY

STANFORD CENTER FOR RESEARCH AND
DEVELOPMENT IN TEACHING

770 Welch Road, Palo Alto, California 94304
Area Code 415
321-2300 ext. 4717

Institute Staff
Joan E. Sieber, Director
Bette Acuff
Alan De Young
Chandra Dhar
Ted Feely
Jana Floyd
Joan Grossman
Hedva Lewittes
Helen Smith

ED054048

November 14, 1969

After many delays, stops and starts, writing, pilottesting, and rewriting, we are finally ready to start the testing program.

I I would like to discuss with you in the near future some of the details of the tests, but until then let me fill you in on our general procedure for distributing the tests.

There are six tests ready to be given. We plan to distribute them in the following manner:

1. We will mail the test instructions and sample copies of two tests to you. Would you please read through the instructions and look over the sample copies of the test to see if you have any questions about administering them.
2. I would like to talk with you by telephone to answer any questions you might have about the tests and to arrange a time for bringing the tests out to your school.
3. We will deliver the tests to your school at the time agreed on.
4. The completed tests will be picked up at a mutually convenient time and, at the same time, more tests will be delivered.

Would you please call Mrs. Audrey Torrance (321-2300, ext. 4717) before November 19 and leave a number where we can contact you after school hours. Please call collect if you are outside the Palo Alto area.

I hope these arrangements are convenient for you. We appreciate your cooperation, and I am looking forward to working with you.

Sincerely yours,

/at

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION
WASHINGTON, D.C. 20202

APPLICATION FOR ADMISSION

(To Programs supported by Part C and Part D of The Education Professions Development Act)

BUDGET BUREAU NO. 51-RO322
APPROVAL EXPIRES: 6/30/69

INSTRUCTIONS: Type or print, in ink, your answers, and return this form, together with any other forms supplied by the institution or agency to which you apply, to the Program Director, NOT to U.S. Office of Education.

1. NAME OF INSTITUTION OR AGENCY TO WHICH YOU ARE APPLYING

2. NAME OF PROJECT

3. YOU NAME *(First, Middle initial, Last)*

4. HOME ADDRESS *(Number, Street, City, State, ZIP Code)*

5. SEX
☐ MALE
☐ FEMALE

6. AGE
YRS.

7. U.S. CITIZEN
☐ YES ☐ NO

8. SOCIAL SECURITY NUMBER
☐☐☐ ☐☐ ☐☐☐☐

9A. HOME TELEPHONE *(Area Code and Number)*

9B. OFFICE TELEPHONE *(Area Code and Number)*

10. YOUR PRESENT EMPLOYMENT *(Check one)*

a. ☐ I AM EMPLOYED IN A SCHOOL, LOCAL OR STATE EDUCATION AGENCY, COLLEGE OR UNIVERSITY *(Complete the remaining items on this form)*

b. ☐ I AM NOT EMPLOYED IN A SCHOOL, SYSTEM, OR COLLEGE *(Omit items 10 through 18 and specify your employment here)*

11a. NAME OF EMPLOYER

11b. ADDRESS *(Include ZIP Code)*

12a. NAME AND TITLE OF YOUR IMMEDIATE SUPERVISOR

12b. ADDRESS *(Include ZIP Code)*

13. LIST YOUR PRESENT SCHEDULE OF COURSES TAUGHT, PROFESSIONAL ASSIGNMENTS, ETC.

COURSES TAUGHT OR ASSIGNMENTS	GRADES	% TIME PER WEEK

14. LEVEL OF SCHOOL *(or System)*

☐ PRE-SCHOOL
☐ PRE-SCHOOL AND ELEMENTARY
☐ ELEMENTARY
☐ JUNIOR HIGH
☐ SENIOR HIGH
☐ JUNIOR-SENIOR HIGH
☐ ELEMENTARY AND SECONDARY
☐ POST-ELEMENTARY VOCATIONAL SCHOOL
☐ COLLEGE OR UNIVERSITY
☐ ADULT EDUCATION

15. TYPE OF SCHOOL *(or System)*

☐ PUBLIC
☐ PRIVATE, CHURCH-RELATED
☐ PRIVATE, NOT CHURCH-RELATED

16. NUMBER OF STUDENTS ENROLLED *(If you serve a single school)* ROUNDED TO NEAREST 500

17. TITLE OF YOUR POSITION

18. IF YOU ARE PREPARING FOR EMPLOYMENT IN THE FIELD OF EDUCATION FOR THE FIRST TIME, OR AT A DIFFERENT SCHOOL OR LEVEL, OR FOR A DIFFERENT ASSIGNMENT, SPECIFY HERE

OE FORM 7211, 1/69

REPLACES OE FORM 4401, WHICH IS OBSOLETE

19. SUMMARIZE YOUR YEARS OF EXPERIENCE IN TEACHING OR RELATED WORK:

SUBJECTS OR ASSIGNMENTS	LEVEL *(Elem., secondary, etc.)*	YEARS OF EXPERIENCE	SUBJECTS OR ASSIGNMENTS	LEVEL *(Elem., secondary, etc.)*	YEARS OF EXPERIENCE

20. EMPLOYMENT RECORD— LIST YOUR PLACES OF EMPLOYMENT IN TEACHING OR RELATED WORK DURING THE LAST 5 YEARS
(Start with your present or last position and work back)

DATES	NAME AND ADDRESS OF EMPLOYER	NATURE OF YOUR DUTIES

21. WHAT COLLEGES AND UNIVERSITIES HAVE YOU ATTENDED? *(Exclude attendance at institutes or programs you list in items 21 and 22)*

NAME OF INSTITUTION	DATES ATTENDED	DEGREE	MAJOR	MINOR(S)

22. HAVE YOU PREVIOUSLY ATTENDED AN NDEA INSTITUTE, A NATIONAL SCIENCE FOUNDATION INSTITUTE, AN ARTS AND HUMANITIES INSTITUTE, OR A PROSPECTIVE OR AN EXPERIENCED TEACHER FELLOWSHIP PROGRAM? ☐ YES ☐ NO *(If yes, specify each)*

NAME OF SPONSORING INSTITUTION	DATES ATTENDED	SUBJECT FIELD	NAME OF INSTITUTE OR PROGRAM DIRECTOR

23. DESCRIBE ANY OTHER SIGNIFICANT ACADEMIC EXPERIENCES YOU HAVE HAD IN THE SUBJECT FIELD OF THIS INSTITUTE OR PROGRAM *(such as summer programs, workshops, or seminars)*:

24. DOES YOUR PRESENT EMPLOYMENT INVOLVE THE TEACHING OF SPECIAL CLASSES FOR PHYSICALLY OR MENTALLY HANDICAPPED CHILDREN AND YOUTH, OR THE SUPERVISION OR ADMINISTRATION OF SUCH SPECIAL CLASSES? ☐ YES ☐ NO

IF YES, INDICATE WHETHER THE SCHOOL IS:

☐ EXCLUSIVELY OR PRIMARILY FOR THE HANDICAPPED,

OR

☐ ONLY INCIDENTALLY FOR THE HANDICAPPED

25. WHAT TEACHING CERTIFICATES OR OTHER CREDENTIALS DO YOU HOLD? *(Indicate type, level, subjects, etc.)*

26. I CERTIFY that the statements made by me in this application are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.

DATE	SIGNATURE OF APPLICANT

U. S. GOVERNMENT PRINTING OFFICE : 1969 O - 332-390

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION
WASHINGTON, D.C. 20202

BUDGET BUREAU NO. 51-R0596
APPROVAL EXPIRES: 12/31/70

CONFIDENTIAL EVALUATION

(For Programs supported by Part C and Part D of The Education Professions Development Act)

TO THE EVALUATOR

Please complete this form and return to:

DO NOT MAIL
TO THE U.S. OFFICE OF EDUCATION

NAME OF APPLICANT *(The individual named is seeking admission to the educational program named below)*

NAME OF PROGRAM

NAME OF SPONSORING INSTITUTION OR AGENCY

SUBJECT FIELD

DATES OF TRAINING
FROM
TO

TO BE COMPLETED BY THE EVALUATOR

1. NAME OF EVALUATOR

TITLE OF YOUR POSITION

SCHOOL *(or System)*

2. HOW LONG HAVE YOU KNOWN THE APPLICANT AND IN WHAT CAPACITY?

3. CONSIDERING ALL THE EDUCATIONAL PERSONNEL WITH WHOM YOU HAVE WORKED OR SUPERVISED, HOW WOULD YOU RANK THE APPLICANT ON THE FOLLOWING CHARACTERISTICS

CHARACTERISTICS	EXCELLENT	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	POOR	CAN'T JUDGE
a. Ability as a teacher *(or specialist)*						
b. Knowledge of subject matter						
c. Effectiveness in working with students						
d. Effectiveness in working with colleagues						
e. Leadership potential						
f. Scholastic ability; capacity for growth						

4. PLEASE PROVIDE ANY COMMENTS ON THE APPLICANT'S ABILITY, PERFORMANCE, CHARACTER, TEMPERAMENT, ETC., WHICH YOU BELIEVE WILL AID THE SELECTION COMMITTEE IN DETERMINING HIS OR HER SUITABILITY FOR THIS EDUCATIONAL PROGRAM

5. IN WHAT WAYS DO YOU BELIEVE THAT THE APPLICANT WOULD BENEFIT FROM ATTENDING THIS EDUCATIONAL PROGRAM? *(If the applicant has specific areas of need, please indicate them)*

6. DOES THE APPLICANT HAVE A CONTRACT, OR THE OFFER OF A CONTRACT, IN YOUR SCHOOL SYSTEM FOR THE NEXT YEAR?

☐ YES ☐ NO ☐ I DON'T KNOW *(If "NO," please explain)*

7. PLEASE COMMENT ON WAYS IN WHICH YOUR SCHOOL OR SCHOOL SYSTEM MAY UTILIZE OR BENEFIT FROM THE TRAINING RECEIVED BY THE APPLICANT IF HE OR SHE IS SELECTED FOR THIS EDUCATIONAL PROGRAM

8. SIGNATURE OF EVALUATOR

DATE

OE FORM 7212, 1/69

REPLACES OE FORM 4404, WHICH IS OBSOLETE

GPO : 1969 O - 332-392

STANFORD CENTER FOR RESEARCH AND DEVELOPMENT IN TEACHERS
770 Welch Road
Palo Alto, California 94304
321-2300 ext. 4717

June 14, 1969

I am happy to inform you that you have been accepted as a participant in the Stanford Institute on Teaching for Reflective Thinking. A total of 15 persons were accepted into this Institute. Enrollment was limited so that the participants and the members of the Institute staff could work together closely throughout the year in this experimental program.

The Institute will extend over three periods: June 23, to July 3, 1969 (Monday through Saturday and Monday through Thursday); August 18 to 28, 1969 (Monday through Saturday and Monday through Thursday), and March 30 to April 3, 1970 (Monday through Friday). Class will be held from 9:00 A.M. until 12:00 Noon, with work groups, discussion groups and individual consultation from 1:00 P.M. to 3:00 P.M.. You should plan to participate in the entire program, including the continuing relationship with the Institute staff throughout the school year as described below. A stipend of $375.00 and a dependency allowance of $75.00 per dependent will be paid to you. University credit will not be given for participation in this Institute. The Institute is sponsored by the U. S. Office of Education, Educational Personnel Development.

Our first session, on June 23rd, will be held in room 2 of the Art Building. The attached map shows the location of our class on campus and also indicates the location of appropriate parking facilities. (In addition, we enclose information on various campus facilities, which may be of interest to you.)

A brief summary of the Institute schedule follows.

During the first session (June 23rd to July 3rd) meetings will be devoted to the following topics:

1. What things are meant by Reflective Thinking and Appropriate Incertitude?
2. What are the purposes of teaching students Reflective Thinking?
3. What specific kinds of teaching and evaluation techniques promote development of reflective thinking skills?

4. How are these methods best applied? Examples will be given of applications of these methods. You will have an opportunity to develop applications of these methods to your own teaching material.

5. These techniques will be discussed in relation to the goals of various curriculum areas (social studies, art, science, mathematics, language arts). Practice will be given in developing lessons in the various curriculum areas.

6. The design and use of appropriate evaluation techniques will be discussed.

7. Plans will be made for the summer's work -- your reworking of next years teaching plans and materials in accord with what you have learned in this Institute. This includes making arrangements to keep in touch with our staff consultants.

From August 18th to 28th, we will be meeting at Stanford again. You will have an opportunity to discuss your new teaching plans, and then to practice skills of teaching for reflective thinking in a micro-teaching clinic. Plans will be made for a continuing work relationship between yourself and the Institute staff throughout the school year.

At the beginning of the school year, the reflective thinking skills of your students will be evaluated by yourself with the assistance of the Institute staff. Throughout the school year, the Institute staff will continue to consult with you, observing your teaching from time to time, and continuing to evaluate students progress in their development of reflective thinking skills. Aid will be given to you in handling any special problems which may arise.

From March 30th to April 3rd (spring vacation), the Institute will reconvene at Stanford to evaluate the techniques and practices that have been developed, discuss problems that have arisen in connection with these teaching approaches, and to plan your own in-service instruction of teachers in your school during the next year.

Within a few days you may expect to receive an outline and brief description of Institute activities. On behalf of the entire staff, we wish to congratulate you on your admission to the program. We very much look forward to working with you in the forthcoming year.

Very sincerely yours,

Joan E. Sieber
Director

JES:at

SCHOOL OF EDUCATION
STANFORD UNIVERSITY

STANFORD CENTER FOR RESEARCH AND
DEVELOPMENT IN TEACHING

770 Welch Road, Palo Alto. California 94304
Area Code 415
321-2300 ext. 4717

November 3, 1969

To : All Institute Teachers

From : Hedva Lewittes

The purpose of this letter is to summarize what happened at the meeting on October 21 and to let you know what we are planning in the near future.

Summary of the meeting:

1. Those teachers who attended were Barbara Anderson, Lee Jenkins, Janis Lockler, Judy Moulton, Elizabeth Morgan, Gina Stout, Roger Wilson, and Duane Zampedri.

Those members of the staff who attended were: Dr. Sieber, Bette Acuff, Joan Grossman, Ted Feely, Jana Floyd, Hedva Lewittes, Helen Smith and Alan de Young.

2. We all ate a delicious dinner. The new members of the staff were introduced.

3. We discussed how uncertainty training had affected teaching so far. Janis Lockler told us about a movie that had been shown to her class. Judy Moulton felt that in one lesson she had succeeded in getting the children to express many different points of view. Elizabeth Morgan mentioned that her children had great difficulty in describing objects to other people. We talked about the difficulties involved in teaching children that there may be several different points of view on a subject and that there may be no right or wrong answer to some questions.

4. We adjourned to the living room and brought up the problem of materials. Dr. Sieber suggested that the staff might compile several complete instructional kits in several subject areas which could be used to teach units in reflective thinking. Several of the teachers felt that they would like the staff to work with them individually on a unit in specific subject areas. We asked each teacher to write down the subject area (s) he or she would like to work in. Each teacher will work with two staff members. Tentatively the staff will work in teams composed as follows:

Bette Acuff and Hedva Lewittes
Jana Floyd and Joan Grossman
Ted Feely and Alan De Young
Chandra Dhar and Helen Smith

Roger wilson mentioned that he had done a good deal of work with reflective thinking in math. He offered to share his knowledge with anyone who is interested.

5. We discussed a teacher observation schema that Jana Floyd had written.

6. We agreed that at our next meeting we would like to see the Polya film again.

Plans for the Future

1. Our next meeting will be on Wednesday November 19, 5:30 to 9:30 at Dr. Sieber's house. (If you lost the map, give us a call.)

2. For those of you who didn't indicate a preference as to the subject area you would like to work in and for those who weren't at the meeting, please indicate the area(s) that you would like to work on. We have enclosed a postcard for this purpose. If you all send us the post cards by the next meeting, at the latest, we will be able to organize for our individual meetings.

3. We started pilot testing this last week so by our next meeting all your classes should have been tested.

Hope to see you all at the next meeting.

Hedva Lewittes

Joan

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STANFORD CENTER FOR RESEARCH AND
DEVELOPMENT IN TEACHING

770 Welch Road, Palo Alto, California 94304
Area Code 415
321-2300 ext. 4717

ED054048

February 11, 1971

Dear

Further notes on the procedure:

For your second videotaping that uses a physical science film, the procedure will be as follows:

1. Explain to the students that they will play a "figuring out" game in which they will
   a) watch a film (more than once if they wish)
   b) think of one or more ways to explain what is happening in the film.
   c) ask questions that you will answer by 'yes' or 'no' or 'I don't know'
   d) use the 'yes' 'no' 'don't know' answers to figure out which explanations are likely to be appropriate (or which explanations are likely to be wrong).
   e) describe at least one "solution" to the problem that the film presents.

2. Your role is one of a moderator, rather than teacher. That is, for this discussion, you are to help the students hear what each other is saying rather than giving information. What the children conclude from watching the film will be the result of their own observations, analogies, and hypotheses. The purpose of the discussion, then, is not to see "how much" the students learn, but to see whether they can help each other put together information and think of (one or more) appropriate solutions.

3. There is no one right answer in the films. The information I xeroxed for you may or may not be useful. The students may discuss an entirely different aspect of the film than you or the authors of the film had expected.

4. Your 'yes' 'no' 'don't know' answers will be the only source of additional information available to the students. These answers may guid them and keep them from trying to use wrong information.

5. I hope you enjoy using this inquiry approach in which the burden of understanding a concept is placed completely on the student. If your students are not familiar with this method, it will probably be difficult for them at first. In that case, make them realize that they will not be able to use you as a dispensor of information. Instead, they will have to think of good questions and explanations. They must not expect you to play a usual "teaching" role.

6. The films and xeroxed materials were made by J. Richard Suchman.

Helpfully, I hope!!!

Jana Floyd
Assistant Uncertainty Project

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SCHOOL OF EDUCATION
STANFORD UNIVERSITY

STANFORD CENTER FOR RESEARCH AND
DEVELOPMENT IN TEACHING

770 Welch Road, Palo Alto, California 94304
Area Code 415
321-2300 ext. 4717

ED054048

February 18, 1971

Dear

Further notes on the procedure:

Stage three in videotaping will be using physical science films: After you show the third film to your class, use the following inquiry -technique procedure:

1. Explain to the students that they will again play a "figuring out" game in which they will
   a) watch a film (more than one if they ask);
   b) consider the film as a series of events that explains "something";
   c) think of an explanation that will "put together" or make sense of the series of events;
   d) call this explanation a "hypothesis" and ask you (the teacher) to write the hypothesis on the blackboard;
   e) discuss evidence (from the information given in the film, from other information sources or from personal experience) that supports the hypothesis. We ask you (the teacher) tp place supporting evidence under hypothesis.
   f) be critical. Discuss which hypotheses have more believable or stronger evidence. Discuss whether any of the hypotheses can be "conclusively" accepted or rejected.

2. Your role will be that of moderation and secretary, rather than a dispenser of information. That is, you will write all of the hypotheses on the blackboard and the supporting evidence that the class agrees upon. When a student suggests

evidence, you can ask the class:

> Is this evidence true or accurate? Is this evidence helpful? That is, does it support a hypothesis?

After students have exhausted all the hypotheses and supporting evidence you will help them evaluate the relative strength of each hypothesis- based on the supporting evidence, not on your knowlege. Try to help them figure which hypotheses are not likely to be true using the amount and appropreateness of evidence as a guide.

3. The class may end up with several hypotheses that they cannot reject, including hypotheses that you know are not true. If so, you may want to ask the students to pursue the subject later, if they are interested. They could, for example, think of and carry out related "experiments"; observe more natural events, or look in books for more information.

4. As in the other discussion, there are no single "right" answers. The value of inquiry teaching is in students' learning a process of thinking rather than gathering information. If they learn to present hypotheses, support their ideas with evidence and critically evaluate the relative strength (or veracity) of each hypotheses, they will have obtained valuable experience in learning to think.

5. I am interested, after each film, to get feedback from you on using these films and students' reaction to inquiry approaches. Be sure to fill in the teacher-opinion evaluation forms and send them to us.

Thank you for your cooperation.

Sincerely,

JMF:RET

Jana Mason Floyd

ED054048

APPENDIX D

Schedule of the first week of
the Institute

SCHEDULE FOR 1st WEEK OF THE INSTITUTE ON TEACHING FOR REFLECTIVE THINKING

Monday, June 23, 1969

9:00 A.M. Coffee & an Opportunity to get acquainted. Schedule of events:

10:00 - 11:00 "Reflective Thinking and Appropriate Uncertainty: definition, relation to the aims of education, methods of teaching, evaluation.

Joan Sieber

11:00 Break and discussion of purpose and procedure of Institute.

12:00 - 1:00 Lunch

1:00 - 3:00 "Good Listening: The Value of the 'don't know' option."

Lou Weiss.

Tuesday, June 24, 1969

9:00 - 10:15 "Appropriate Uncertainty in learning Science and Scientific Thinking: Some Teaching and Evaluation Techniques."

Joan Sieber

10:15 - 10:30 Coffee break

10:30 - 12:00 Discussion and application of techniques.

12:00 - 1:00 Lunch

1:00 - 2:15 Appropriate Uncertainty and Problem Solving. "Let us Teach Guessing," film by George Polya

2:15 - 2:45 Discussion of film.

2:45 - 3:00 Organization of groups for preparation of science lessons.

Wednesday, June 25, 1969

9:00 - 10:15 "The Nature of Decision Making. Use of Verbal Techniques in Teaching for Reflective Thinking."

Joan Sieber

10:15 - 10:30 Break

10:30 - 12:00 Discussion and some application to Social Studies teaching.

12:00 Lunch

1:00 "Principals of Teaching for Reflective Thinking in Art Education."

Bette Acuff Discussion and other applications

Thursday, June 26, 1969

9:00 - 10:15 Workshop in science and other areas of your choice

Developing behavioral objectives

Selection and planning of teaching techniques

Developing evaluation techniques

10:15- 10:30 Break

10:30 - 12:00 Workshop

12:00 - 1:00 Lunch

1:00 - 1:45 "Appropriate Uncertainty in Social Studies"

Joan Sieber

1:45 - 2:00 Break

2:00 - 3:00 "Reasons for Not Knowing"

Marilyn Epstein

Friday, June 27, 1969

9:00 - 10:15 "Methods of Teaching Reasons for Not Knowing: Modeling and Concept Formation"

Marilyn Epstein

10:15 - 10:30 Break

10:30 - 12:00 Applications to material from text books. Marilyn Epstein

12:00 - 1:00 Lunch

1:00 - 3:00 "Role -Playing Techniques."

Jane Stallings

Saturday, June 28, 1969

9:00 - 12:15 Role-playing Workshop

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APPENDIX E

Some handouts that accompanied teaching demonstrations

SOME SUGGESTIONS ON THE USE OF UNCERTAINTY IN A LESSON ON RACIAL AND ETHNIC MINORITIES IN AMERICA

The purpose of the next few pages is to provide some suggestions for developing a social studies unit using uncertainty. This merely provides some possibilities from which you may wish to choose. In no way is it to be seen as a prescription for what ought to be done. The issues, problems and possibilities surrounding racial and ethnic minority relations in America is much too important and sensitive for the Institute staff to be prescribing teaching approaches. It is your judgment which must be relied upon in dealing with such an important topic. To reiterate, we are making some suggestions. Please feel free to alter, adapt or reject any and all suggestions.

Uncertainty--What is it?

In this context we will define "uncertainty" as an individual, or subjective, state in which a person perceives one or more competing alternatives or does not know what to do to resolve a particular problematic situation. Uncertainty, as we use the term, has several characteristics:

1. It is subjective. That is, it is felt by individuals and is personal.

2. It can be public. That is, individuals can be uncertain about the same things.
3. Perhaps, the most pervasive quality,~~or~~ expression or indication of uncertainty in an individual is open-mindedness.
4. Uncertainty is not the same thing as ignorance.

Uncertainty--What part does it play in this unit?

As we conceive of it, the purpose or objective of this unit is to bring students to explore racial and ethnic issues in America.

It appears that uncertainty is a motivating state which is intrinsic to the topic being studied. It is our hypothesis that to the extent that students are uncertain about an issue which is important to them, they will be motivated to try to overcome the uncertainty. We see uncertainty as a realistic starting point for any attempt to deal with real, live, issues. Therefore, uncertainty is not the goal, or objective, of this unit but can be seen as a natural part of any attempt to deal with issues which are real to the individuals in your class. To the extent that your students have already fixed points of view and see controversy as merely a debate in which one group tries to convince the others, uncertainty will not be present.

Part of your role, as we conceive it, is to help students beome aware of gaps in their knowledge, and inconsistencies in their thinking. This requires not merely pointing out such gaps and inconsistencies, but the dramatization and highlighting of these in such a way that students see them as significant. Your role in making use of uncertainty--perhaps, we should say "in generating uncertainty"--in the classroom is not a passive role. It requires a judicious mixture of deciding what issues are significant, what issues can be meaningful to your students and a healthy amount of zest in dramatizing the issue and its importance to mankind.

In the following pages several alternative strategies for introducing uncertainty will be suggested as well as some suggestions for how reflective thinking can be fostered.

Some Alternative Strategies for Generating Uncertainty

1. Elicit students' perceptions of racial relations, problems and issues as well as possible solutions. It may be helpful to have students state perceptions in an impnersonal manner--e.g. "Some people say..."
   This approach is difference from the others that follow in the sense that it is designed to be as

1. indiract as possible, to elicit the kinds of things which are on the students' minds. It might be started by having students respond to a newspaper article or story. An open-ended question such as "What do you think about that?" etc. would be appropriate. (Note, merely having students state alternative positions on an issue is not likely to generate uncertainty. See # 1 on page 6.)

2. Ask a question which you believe will provide the focus for study. For instance, since film strips provided in the lesson are largely about the experiences of young Blacks, you might introduce a lesson by such questions as: What is it like to be a Black person in the United States? or Some people say that all people in the United States have the same opportunity to get ahead, but others say that Black people don't. What do you think about that?

3. Use one or more frames from a filmstrip and have your students attend to all the cues they are able to note. Then, select a another frame which contrasts markedly in composition. To the extent the contrast focusses upon a significant issue it may serve as a basis for generating uncertainty.

4. Have students fill in the dialogue for a filmstrip before they have a chance to hear the accompanying

record. To the extent that students come up with different "guesses", these can serve as foci for developing uncertainty.

5. Have students respond on a piece of paper to several issues which you believe are significant and which your students would be interested in. For instance you may have students respond to the following:

   1. All Americans are treated the same no matter what race or religion they are?
      a. agree strongly
      b. agree
      c. No opinion
      d. disagree
      e. disagree strongly
   2. Most White Americans are prejudiced against Black Americans.
      a. agree strongly
         etc.
   3. Most Americans are in favor of integrated schools.
      a. agree strongly
         etc.

The questions can be designed in such a way that they will point out differences in students' opinions. These differences can then be exploited by developing the issues which underly their differences. (A danger in this approach may be that students will get too involved in defending their own viewpoint.)

What Next?

We are hoping that this unit will enable students to deal creatively with a set of issues which are significant to Americans.

1. Once students have expressed their ideas and differing viewpoints--or, you have introduced some different viewpoints--, what can be done to generate uncertainty and to foster reflective thinking?
   A. The different viewpoints the students have expressed as are the raw material for generating uncertainty. You can focus upon contradictory ideas or points of view which appear to be significant. For instance, students may have offered the following types of statements:

      "Some people say that only lazy people are poor in the United States."

      "Some people say that some Black people are poor because White people don't treat them fair."

      These ~~statem~~ statements can be used to focus upon the problems surrounding race and poverty in America. (The extent to which students see that their statements can be taken as "guesses" --remember Polya!--they can feel free to examine them.)

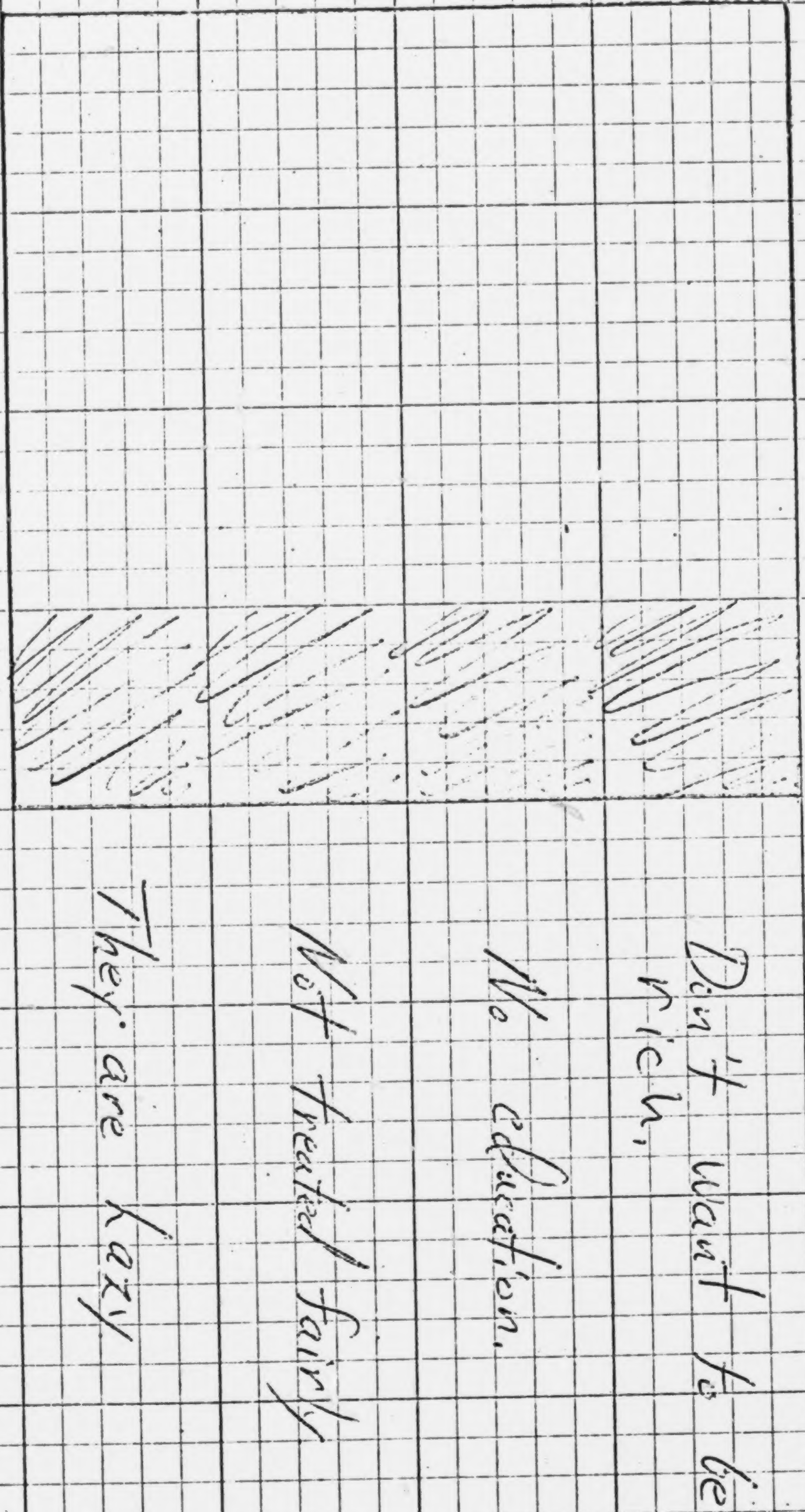
B. The teacher can help students to see the contradictions, or issues, in their statements. (This would also be true when such things as newspaper articles or other materials are providing the raw material.)

C. Highlight and dramatize the issue upon which you wish to develop uncertainty. For instance, this might be done by point out to the students that they have "hit upon" a problem which some of the most important people in the world are trying to deal with. You might, also, point out that they have done a very important and difficult thing--i.e. to identify an important problem. In essence, your task is to point out to them the significance of the issue they are dealing with.

2. It may be useful and interesting to have your students use a technique at this point developed by Marilyn Epstein. Give the students graph paper. (See the example on the following page.) If there are four alternative ideas before the class--three or more should suffice--have students enclose a 4 x 4 square on the graph paper. Below each row of squares, have students indicate a different alternative. Students then have as many votes as there

NATIONAL
12-285
MADE IN U.S.A.

Why Poor People Are Poor



5 Squares
to the Inch

are alternatives. Students can show their complete belief in one alternative by filling in all four squares ~~and~~ over their favorite alternative or their relative state of uncertainty by distributing votes to more than one alternative. (Loyalty or antipathy to other students in the class may have much more to do with voting than "uncertainty," but the graph may give you some indication of which students appear to feel the uncertainty of the issue as well as a kind of pre-measure which can be compared with a later point in time.) Lee Jenkins has had much experience using this technique and is the most qualified person to contact regarding its usage.

Now That Many Students Are Uncertain About The Issue, What Next?

1. It may be very useful to teach students how to make deductions from a hypothesis. This is essentially a process of asking oneself, if something is the case then what deductions can we make from the "guess" or hypothesis that can be observed. For instance, "If only lazy people are poor in the United States...", then what other things should we be able to observe? Should we be able to observe a poor person holding several jobs? This is a useful skill which can be used in a variety of situations.

9

2. Explore with students the possibilities of "testing" alternatives by making deductions and then looking for evidence to disconfirm the hypothesis. (This is a method used by scientists. Note, it is frequently possible to find evidence which confirms a hypothesis--in fact it is usually quite easy--but this confirming evidence does not prove a hypothesis to be true. Any valid disconfirming evidence is enough to reject the hypothesis. The logic of this method is simple and straighforward. For instance, "If only lazy people are poor in the United States," then any cases which are contrary to this point out the weakness of the hypothesis--e.g. finding cases of poor people who work very hard and diligently throws the hypothesis into question.

3. Have students try to test some hypotheses. Note! It is not easy to develop good testable hypotheses, or guesses. The following hypotheses are not easily testable as they are stated:
"People who take dope would just get hooked on something else like alcohol if they couldn't get dope."
"Bussing pupils is the best way to integrate."
"If the United States got out of Vietnam right now, all Southeast Asia would fall to the communists."

ED054048

Microteaching Lessons

Art

Stanford Institute on Teaching for Reflective Thinking

In the next few days you will be viewing taped recordings of lessons in art appreciation which show some teaching techniques for generating and dealing with uncertainty.

Please read the introductory material on pages 1-3 so that you are familiar with the general objectives of the lessons you will see. Pages 4-6 provide a transcript of the questions used in each lesson, with the expected student behaviors listed in parentheses on the left side of each question. We hope this format will help you to evaluate the effectiveness of the teaching sequence you are viewing with regard to the stated desired student behaviors and objectives of the Reflective Thinking Project.

On page 8 is a chart of the student-teacher interaction pattern envisioned in these lessons.

a

MICROTEACHING LESSONS

ART

In any teaching situation the teacher should be aware of the types of thinking processes and content which are appropriate for the student in the realization of the lesson's objectives. The teacher should also be skilled in techniques which elicit these processes and content. In the following lessons, our objective has been to stimulate reflective thinking with regard to art by structuring situations so as to generate uncertainty and to provide the student with some strategies for resolving such uncertainty.

We define processes as the mental operations in which the child engages to deal with stimuli by establishing relations between them so as to make sense out of his environment. We have attempted to facilitate the following analytic and synthetic thinking processes:

1. Attending to and describing cues
2. Ordering and relating the described cues into categories: that is, classifying cues
3. Recognizing and examining values and feelings
4. Generating hypotheses on the basis of relevant information
5. Testing hypotheses in light of additional information
6. Generalizing
7. Drawing conclusions or making judgments

The content which the child incorporates into his cognitive structure is the product of the processes he employs and the nature of the subject matter which serves as his medium of operation. Content has both quantitative and qualitative dimensions. Quantity refers to the number of products children produce: the types of items of information, classes, hypotheses, and generalizations. Hilda Taba (1967) refers to three classes which children frequently create when grouping items together:

1. Contiguous groupings: Items grouped together because they are used together or found together in a particular place. (For example, baskets and potatoes; knife and spoon). This is the lowest level of grouping.

2. Descriptive groupings: Groups are formed on the basis of color, form, texture, or the materials from which items are made. (Hats and baskets are both made of straw; fleece and clouds are both white).

3. Class groupings form a class which is based on inferred characteristics and similarities. (Hoe and rake both function as tools; bucket and basket are both containers; sculpture and painting are both art forms; worry and tired are both feelings). This is the most complex type of grouping. Within class groupings, those items which are related to feelings and attitudes frequently represent a particularly high level of thinking.

(Bruner (1967) makes a distinction which may be useful in looking at the types of categories formed by children. Functional categories are based on the fact that objects classified do, indeed, fulfill a certain function. Formal categories are based on the attributes which define the class, and are more abstract and inclusive than functional classes. For example, the category of "mechanical force" includes the functional classes of implements, as well as the more abstract concepts of the conversion of energy, the change of direction and point of application of force through the use of leverage, linkage, and other mechanical means. The abstract category of "art forms" includes not only the various forms of paintings, sculpture, music, dance, etc., but does so because of such common defining attributes as rhythm, contrast, variation, and theme.

Our lessons have been developed so as to stimulate the formation of categories which may generate hypotheses. The child is presented with an array of paintings which at first glance do not appear to have common elements. The teacher asks questions which generate cue attendance. In this context we define "cue" as a salient visual feature or sensory quality of a work of art which serves as an index to the work's total expressive character. Examples of such cues are shown by the desciptive statements: "I see brilliant, warm colors on on the girl's dress." "Some of the figures are grouped close together in the front, while those in the back are spaced far apart." "There are delicate lines on the surface." "The paint is brushed on in big, bold strokes."

By listing the children's observations, the teacher stimulates the formation of categories based on discovered commonalities between paintings. By altering some of the paintings in various ways, the children and teacher explore together new alternatives posed by this changed situation. These alternatives may function to make the boundaries of certain categories more clear, or may enlarge the boundaries of others.

Finally, the children are presented with an array of ambiguous objects. The children form hypotheses which deal with the realm of the possible, utilizing fantasy to form new categories which are based on potential defining attributes.

Since the arts are concerned with the development of the sensibilities, and since they both embody and elicit feelings, they provide an avenue of clarification and expansion for the feelings of the child. We have intended to provide for the recognition of feelings and attitudes by stimulating, through questioning, the examination of subjective feelings evoked by the paintings.

Just as classes may vary as to level of inclusiveness, so may hypotheses and generalizations. Those which encompass more information are more "Powerful" than those which encompass less information. A recent study (Bourne, 1965) has shown that more efficient learners are able to formulate hypotheses which both encompass more information and are more consistent with previous information than those generated by poor learners.

Bruner (1967) has described two types of hypothesis formation, each of which implies a different strategy for dealing with information. The first type is the "wholist" hypothesis in which the individual formulates an initial hypothesis based on a wide variety of attributes in the hypothesis generating situation. He then systematically checks the validity of each attribute by focussing on confirming instances in new situations. The "wholist's" hypothesis is modified at each step to incorporate the information gained in these new encounters.

The second, or "partist" hypothesis, is formed on the basis of a selected few attributes noted in the hypothesis-generating situation. Should the hypothesis fail to be confirmed in subsequent instances, the person attempts to change the hypothesis, substituting other attributes remembered from the initial and other former instances. He repeats this testing procedure, eliminating those attributes which are not confirmed in the testing situation.

The questions which follow are sequenced so as to facilitate the formation of increasingly more inclusive categories which can be gradually integrated by the child to enable him to generate increasingly more powerful hypotheses and generalizations.

Lesson One: (Corot: "Woman with Pearl" and Roualt: "Heads of Two Clowns")

(Cue attendance: the teacher lists all items on the board above each painting)	1. "What are the different things you can tell me about these people?"
(Elicits feelings)	2. "How does this person make you feel?" (Corot)
	3. "How do these people make you feel?" (Roualt)
(Directs attention to formal qualities: shapes, lines, colors, etc.)	4. "What things did the artist use in the paintings to give you this feeling?"
(Teacher stimulates establishment of categories and gains some insight into the children's mode of operation by asking for reasons for categories formed)	5. "Can you see some words which we wrote down above both of the paintings which you think belong together?" "Why?"
(Teacher calls attention to additional cues by altering the stimulus situation)	6. "What happens if . . . we put this color over the painting?" "What do you feel now? Why?" "What do you see?"
(Children test established categories and generate new ones)	7. "What happens if . . . we change the color of the woman's bolero?" . .we cover the painting with clear plastic . . .how can you make changes with crayon so that the woman will look more like the two heads?" . ."What do you see? How does the painting make you feel now?"
	8. "Can anyone think of some other ways in which we could change the painting so that it would make us feel differently? What has happened to the appearance of the painting?"

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Lesson Two: (David: "The Oath of the Horatii"; Rembrandt: "The Night Watch")

(Cue attendance: teacher lists items above each painting)	1. "What are all the different things you see in these paintings?"
(Formation of categories) feelings	2. "How does this painting make you feel?" (David) "And this one?" (Rembrandt)
(Hypothesis regarding theme	3. "What is happening in the paintings?"
(Cue attendance: (Formal qualities (Pervasive quality--composition	4. "How are these paintings alike?" 5. "How are they different
(Stimulation of hypothesis formation and check on established categories)	6. "If you had to explain to a friend what these two paintings are about, what could you say?"
	(In order to answer the last question, the children assemble in small groups of two or three to compose a short explanation. The result of their efforts may be presented to the class for discussion. Children may compare these alternative explanations and gain from each other's differing views)

(Later: to check on categories, the teacher may display an array of four or five paintings, some of which are similar to the two above in theme and formal qualities . . . The children are then asked to select the paintings which are like the David and Rembrandt, and to state their reasons for their selections)

Lesson Three: (Cezanne: "Mont St. Victoire"; El Greco: "View of Toledo";
Miro: "Composition"; Van Gogh: "Field at Arles")

(Cue attendance to formulate categories)	1. "Can you find some ways that these paintings are alike?"
(Identification of component elements and devices employed by artists to evoke mood or feelings)	2. "Do any of these paintings make you feel the same?" "Why?" 3. "Can you point out and name the things in both which make you feel the same?"

Lesson Four: (Array of Objects)

(Cue attendance: teacher lists items)	1. "What are all the different things you notice about these?"
(Teacher and children form category lists)	2. "Let's look at our list and see how many different kinds of things we have listed."
(Stimulation to create new categories from possibilities suggested by objects) (Hypotheses re: functions of objects)	3. "Just suppose you were an inventor or an artist or creative genius . . . How many different things could you think of to do with these objects? Could you think of some unusual names for them or for the way in which you discovered you could use them?"
(Children may work in groups of two to complete this task)	4. "Write down as many things, names, and ways these could be used to create something new . . . your ideas may be strange or wild, but that is alright . . . Tell me why you think these ideas would be good ones . . .?"
	5. (After a suitable time has elapsed)
(Formation of more inclusive categories on the basis of = commonalities)	"Now, let's see how many different kinds of things we have thought of . . .(Lists on board)
(Check on categories formed)	"Are some of these things alike? In what ways?" "Are some of them different? How?"

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Stanford Institute on Teaching for Reflective Thinking

Sample Lessons--Art

In the next few small group sessions we will use these sample lessons as learning exercises to:

1. Acquaint you with some basic art concepts (see pages 1-5).
2. Practice the formulation of appropriate questions for
    a) focusing students' attention on visual information (cue attendance)
    b) promoting the generation of alternative hypotheses
    c) providing practice in comparing and forming judgments (see pages 3 and 6-8)

Please read pages 1-5 prior to our next meeting. We will discuss the concepts and question-types described there before proceeding to the sample lessons.

On the following pages are examples of activities which may be useful in introducing students to the concept of warranted uncertainty in the context of art experiences. (This concept is fully discussed in the paper, Lessons in Uncertainty, by Joan Sieber Suppes).

Art experiences are of three major types: the CRITICAL, in which the student develops his sensibilities to qualities of the visual environment, and in which he acquires a vocabulary of terms which enables him to engage in discourse about art; the HISTORICAL, in which the student acquires an understanding of the role of art in human affairs; the PRODUCTIVE, in which he acquires those manipulative skills which enable him to give expressive visual form to media.

The ability to attend to relevant infromation about art works and to the sensory qualities which pervade them requires that the student be open to many alternatives; that he be flexible in attending to, evaluating, and synthesizing new information. These kinds of behaviors have application in all three of the domains mentioned above. In looking critically at a work of art, the student attends to a variety of possible combinations of information from which he generates alternative interpretations of the work's meaning. In creating a work of art, he is open to possibilities of a productive nature: the rearrangement of forms, spaces, lines and colors in his work is constantly disclosing new possibilities to him as the work progresses toward completion. As the artist (child or adult, amateur or professional) produces a work of art, he thinks: He formulates, tests, and re-formulates hypotheses, but he does this in terms of qualities and symbolic images, rather than in terms of verbal or mathematical symbols.

The exercises which are included here are of three types. Type I illustrates the use of statements in training students to estimate the certainty of such statements in light of information given in the situation, or retrieved from memory. Type II illustrates questions of a heuristic nature which are sequenced to promote the generation of a variety of hypotheses about possible meanings conveyed in a painting. Type III illustrates the use of the student's own questions in searching for information to be used in the answering of these questions.

The naive viewer and the work of art:

Individuals who are naive with regard to the visual arts frequently make quick judgments about the content and worth of art works on the basis of superficial and often irrelevant information. Such statements as "I groove it!" "It makes me sick!" "That reminds me of the lake we used to swim in in Minnesota," or, "I just don't understand it: It doesn't look like anything!" are common in the classroom. These statements, while being sincere reports of psychological reactions or evoked associations, are not judgments which have their bases in a careful examination of the relevant visual, formal and expressive characteristics of the work as a work of art which makes a unique statement about particular aspects of life.

Art forms may be attended to on many different levels, and in many different ways. It is the purpose of these exercises to allow the child to explore and to examine these levels; to withhold judgment until he has considered alternative interpretations and relevant information; to consider these alternatives and bits of information in arriving at an *informed judgment* regarding the artistic merit of the work.

Works of art are open to *interpretation*. Much of the meaning of art forms is contained in symbols created by the artist through a process of abstracting from his experiences. Such symbols constitute a "private language" at times a puzzle to the uninitiated. The world of art, says Eugene Kaelin, is "an Alice in Wonderland world, where things may mean whatever you like!" Because individuals differ in their experience and their selective response to stimuli, it is often possible for two people to arrive at equally valid interpretations of the same work. A sharing of these interpretations can contribute to the expansion of the individual student's understanding of the work in question, and to the promotion of tolerance for alternative points of view.

Common properties of works of art:

Following is a list of properties common to works of art. Each category of properties is followed by a definition using examples of properties subsumed under the category. (Other categories may emerge in the course of discussions with students). For each category there are several questions, designed to focus the student's attention on aspects of a work related to the particular category.

Two types of questions are used. The first is phrased so that a number of alternative answers is possible and desireable. This "Alternative-Generating" type of question has two desireable outcomes which may be useful in promoting the inductive thinking which may aid the student in dealing with uncertainty. First, such a question may be re-directed to several students, thus providing an opportunity for an increased number of individuals to *practice* inductive reasoning. Second, each new alternative proposed by a particular student may provide fresh information or interpretations for the group's consideration, so that a broader information base is available to the group for the formation of judgments.

The second type of question requires the student to compare various aspects of several paintings, and to make a judgment or evaluation in order to frame an answer. This "Comparative-Judgmental" type of question has the merit of fostering a search strategy which focuses the student's attention on the relevant visual, formal, and expressive features of the work which may enable him to make a judgment based on careful, focused observation rather than upon unexamined preference or simple caprice.

Here are the list of properties and some sample questions which may be helpful in guiding discussions.

Material Properties: The type of medium used, the manner o techniques of its use, and the surface qualities which result from the combination of medium and technique.

"How do you think the artist could have applied (put on) the colors he used in this painting? (Alternative--generating question)

"Look at these two paintings: Which one of them appears to have the smoothest surface? In which would you say the artist painted the objects so that you feel as if you could feel the velvet of the dress, smell the fruit, feel the warm sunlight?" (Comparative-judgmental question)

Formal Properties: The elements--line, hue, shape, and how they are related to each other so that there is a particular character displayed by the work.

"Which of these three paintings uses the most dark colors? Which uses th lightest? Which uses colors of middle value?" (Comparative--judgmental)

"What mood or feeling do you think is produced by the use of colors in each? Why? (Alternative--generation)

Subject-matter Properties: The obvious objects depicted in the work: people, animals, buildings, boats, water, trees, etc. These objects may be interpreted literally in some works, but in most instances they are the vehicles which project certain emotions or ideas that, taken together, convey the theme of the work.

"Which of these paintings is a landscape? Which is a still-life? What are the different kinds of objects, people, or other things which are shown in each which cause us to call one a landscape and the other a still-life?" (Comparative-judgmental)

"If you were to walk into the landscape picture, what do you think you would feel--think--about the place which is shown? Why?" (Alternative-Generation)

Symbolic Properties: Those ideas or feelings which are represented by the subject matter which is presented in the work. The artist selects certain subjects, people or shapes because they will serve as useful metaphors for these ideas he wishes to convey. Picasso selected and distorted animals and human figures to make a statement about the horrors of war in his painting, "Guernica." George Tooker paints stolid, impassive-looking figures to convey the anonymous character of life in a large city which is burdened by bureaucracy. The Surrealists make use of improbably juxtaposed objects and people, as well as unnatural color-form relationships to create a dreamlike unreal world in their works.

"Look at the two paintings before you. In which one do you think the artist used the most unusual combination of things, or the most unnatural-looking things? What are some of these unusual combinations? . . . unnatural-looking things?" (Comparative-judgmental)

"What do you think these unusual or unnatural-looking things could mean to the artist? . . .to you? What are some ideas you think the artist could be trying to tell you about life by using them in his work?" (Alternative-generation)

Expressive or Physionomic Properties: The visual or physical characteristics possessed by a hue, line or shape which are so strikingly similar to some natural object or emotional state that they appear to represent or express that quality, state or object. Swirling, bold lines may express frantic activity or even noise, as in the work of Franz Kline; delicate outlines may express femininity or quietness as in the drawings of Matisse. Soft, light hues may express happiness; heavy, dark hues may express somberness or sadness.

"In which of these paintings do the lines express the greatest feeling of movement?" (Comparative-judgmental)

"If you could give this painting a new name, what are some names you would give it which would describe the feeling it expresses?" (Alternative-generation) "Why?"

Properties: The coherent relationships of all the foregoing types of properties results in what we may term the "total quality of the work" which distinguishes it as being a unique product of a particular artist or artistic school or period.

"Which of these paintings looks most like a photograph? Which looks most "modern?" Which of these paintings do you think was done by Van Gogh? (Comparative-judgmental)

"If you had to describe the style of this painting in a sentence, what would you say?" (Alternative-generation)

In order to experience the work of art fully, the observer needs to note the properties mentioned above, and their relationships to each other. Perhaps in one work the material properties will dominate (as in abstract expressionist painting or the sculpture of Alvin Light), while in others the material and formal properties are subordinated to the symbolic. The important thing is that the dominant quality may not necessarily be the most obvious quality at first glance: therefore it is important that the student make a thorough survey of the possibilities presented by the work in order to determine what that "total quality" is. The sample exercises which follow are techniques which may be used to facilitate such a survey.

Type I: Estimating Uncertainty (Stimulus-"The Brooklyn Bridge",by J. Stella)

This may be administered in written form with students marking their choice and estimating the degree of certainty they feel about the choice they have made. (See appendix for the definitions of the five "Don't know" reasons which follow each statement). After the choices have been made, students and teacher could analyze the variety of decisions made by individuals, with emphasis placed on the bases for these decisions, derived from these objects, shapes, or qualities they see in the painting before them. If disagreements arise regarding the items, so much the better. These differing opinions will provide more opportunities for discussion of the details to be noted in works of art which aid in making judgments. (Item 4 is a case in point. Why do or do not the circular shapes resemble stop lights? What else might they be, considered in the context of the painting?)

READ EACH SENTENCE CAREFULLY, LOOK AT THE PAINTING AND DECIDE IF YOU THINK THE SENTENCE COULD BE TURE OR FALSE, OR WHETHER YOU DON'T KNOW WHETHER IT IS TRUE OR FALSE BECAUSE YOU DO NOT HAVE ENOUGH INFORMATION TO DECIDE. CIRCLE THE ANSWER YOU THINK IS THE CORRECT ONE. THEN CIRCLE THE NUMBER 1,2,3,4 or 5: WHICHEVER NUMBER GIVES THE REASON FOR CHOOSING THE ANSWER YOU CIRCLED.

A. 1. This picture shows a real bridge. T F Don't know 1 2 3 4 5

2. The artist has used more dark than light colors. T F Don't know 1 2 3 4 5

3. The main idea of this painting has to do with life in the country. T F Don't know 1 2 3 4 5

4. The circular shapes at the bottom of the painting are stop lights. T F Don't know 1 2 3 4 5

5. The artist used many oblique lines in the painting to show depth. T F Don't know 1 2 3 4 5

6. This painting was painted a long time ago. T F Don't know 1 2 3 4 5

B. WRITE DOWN THREE THINGS YOU MIGHT GUESS ABOUT THE THEME (MAIN IDEA OR FEELING) OF THIS PAINTING. ESTIMATE HOW CERTAIN YOU ARE ABOUT YOUR GUESS, AND GIVE SOME REASONS FOR YOUR ESTIMATE.

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Type I: Estimating Certainty (Stimulus: "I and my Village," Marc Chagall)

(This painting is a fantasy--a unique style of surrealism. The artist has combined images taken from his memories of his boyhood in Russia and combined them in a lyrical fashion, so as to evoke a certain mood. The children will have to think carefully in discovering the meaning of the work).

1. This painting shows a real town. T F Don't know 1 2 3 4 5
2. The person on the right is a green giant. T F Don't know 1 2 3 4 5
3. Some of the houses are upside down. T F Don't know 1 2 3 4 5
4. The artist used more bright than dull colors. T F Don't know 1 2 3 4 5
5. The design of the painting is based on circles and triangles. T F Don't know 1 2 3 4 5
6. The paint is applied roughly and heavily. T F Don't know 1 2 3 4 5

Type II: Generating Hypotheses (Stimulus: "The Brooklyn Bridge," and "Winter Landscape" by Breughel)

(The situation is one in which few of the children have the knowledge to arrive at the correct answer. The questions are designed to stimulate speculative thinking: the generation of hypotheses about various aspects of the painting. Encourage unusual hypotheses; encourage the exploration of as many alternatives as possible by stating that the object of the experience is to see how many different ideas we can come up with, and that we will not try to test the ideas for "truth" at this time. The following questions are suggestions for guiding the discussion).

1. Although both these paintings use many vertical lines, they are very different in mood or feeling. If you had to describe the mood of each, what could you say about each one?
2. In which of these scenes would you most like to be, and why?
3. In "Brooklyn Bridge" which shape or shapes are the most dominant What idea or feeling do you think the artist could be trying to show us by using the dominate shape or shapes?
4. Look at the river and the sky in "Winter Landscape." What color or colors would you use to mix the colors you see there? Why do you think the artist painted the ice on the river the color he did, rather than white or light blue (as we usually think ice is colored?)
5. Look at the bottom section of "Brooklyn Bridge"--How does the view of the bridge and city differ from the view at the top? What do you think the artist is trying to show by painting two different views?

Type II: Generating Hypotheses (Folder containing a variety of cut paper shapes)

(The student may see how many different arrangements he can make, using few or many shapes from the kit provided. He is, in effect, considering a variety of spatial arrangement alternatives or "hypotheses" as he manipulates the paper. Each individual will arrive at different solutions to the problem, and the solutions may be compared. The idea that there are infinite possibilities for solution--all adequate, but different--can be discussed. Discuss the "direction" the shapes point which give the feeling of movement; the space between shapes and the way in which this contributes to or detracts from the feeling of movement.)

"How many different arrangements of these shapes can you make which will make your design have the feeling of movement?"

(Older children could cut out their own shapes. They may discover that certain shapes: i.e., curved, pointed or angular-pointed ones, are more successful in conveying movement than other types).

Later: students could look at Van Gogh's"Field at Arles" and describe or point out areas where the artist has created a feeling of movement through the use of shapes, colors, brushstrokes.

(Productive Activity Using Three-Dimensional Forms)

(Give the student five to seven different small objects, colored blocks, scraps of wood, shapes cut from colored paper, sticks, a feather. Some students may have fun finding seven objects at home to bring to school for this activity).

1. How many different pieces of sculpture can you make with these? (Encourage experimentation. Note how the same object, inverted or turned in a different direction, can change the whole appearance of the work).

2. Some criteria for evaluation: How does the relationship of the forms create a feeling of "wholeness" to the piece? How are the materials used so as to show themselves to best advantage? Do the horizontal elements dominate, or the vertical elements, and what does this dominance contribute to the total quality of the work? Can one achieve a feeling of movement with one arrangement, a feeling of stability with another using the same object?

Type III:Discovering Available Information (I and my Village)

(Ask students to look at the work, and either write or state orally these questions they think will secure information).

"What kinds of questions could you ask about this painting? What do you see in the painting which supports the answer to each of your questions?"

The following are some examples of questions which could be asked.

Material Properties:	What kind of paint is used? How is it applied? How could one mix the particular colors in the various areas? How was the tree painted? How was the area in the upper left-hand corner painted?
Formal Properties:	Why bright, dark, or dull colors? Why are the bright-colored areas placed where they are? Why large and small areas of colors? What kinds of lines are used throughout? Why? What shapes are alike? Why did the artist use so many similar shapes? Is there a feeling of depth? Why? Are there some areas where the shapes seem crowded (compressed) together? . . . some areas where the shapes seem spaced widely apart? What is the purpose? Why the pink area sweeping or swerving across the painting from lower left to upper right? Why the use of circular shapes of different sizes? What shapes are used in contrast to the circular ones?
Subject Matter Properties:	What did the artist use as subject matter? Why did he choose these particular shapes or objects?
Symbolic Properties:	What is the main idea of the painting? Why is the woman upside down? Why the face in the doorway at the upper left? Why the woman milking the cow in the midst of the animal face? Why the line drawn from the eye of the man to the eye of the animal? What does the cross stand for? What do you think the tree stands for?
Physionomic or Expressive Properties:	What feeling is expressed by the work? What shapes or lines express certain feelings?

Type III: Discovering available information (A Yellow and Brown Geometric Design)

(Display the yellow and brown design. Begin the discussion with these questions)

1. Look at the design at least a minute. Describe everything you notice about the design, and your reaction to it.

2. How do you explain the different reactions you may have had while looking at the design for a period of time . . .How did it appear to change?

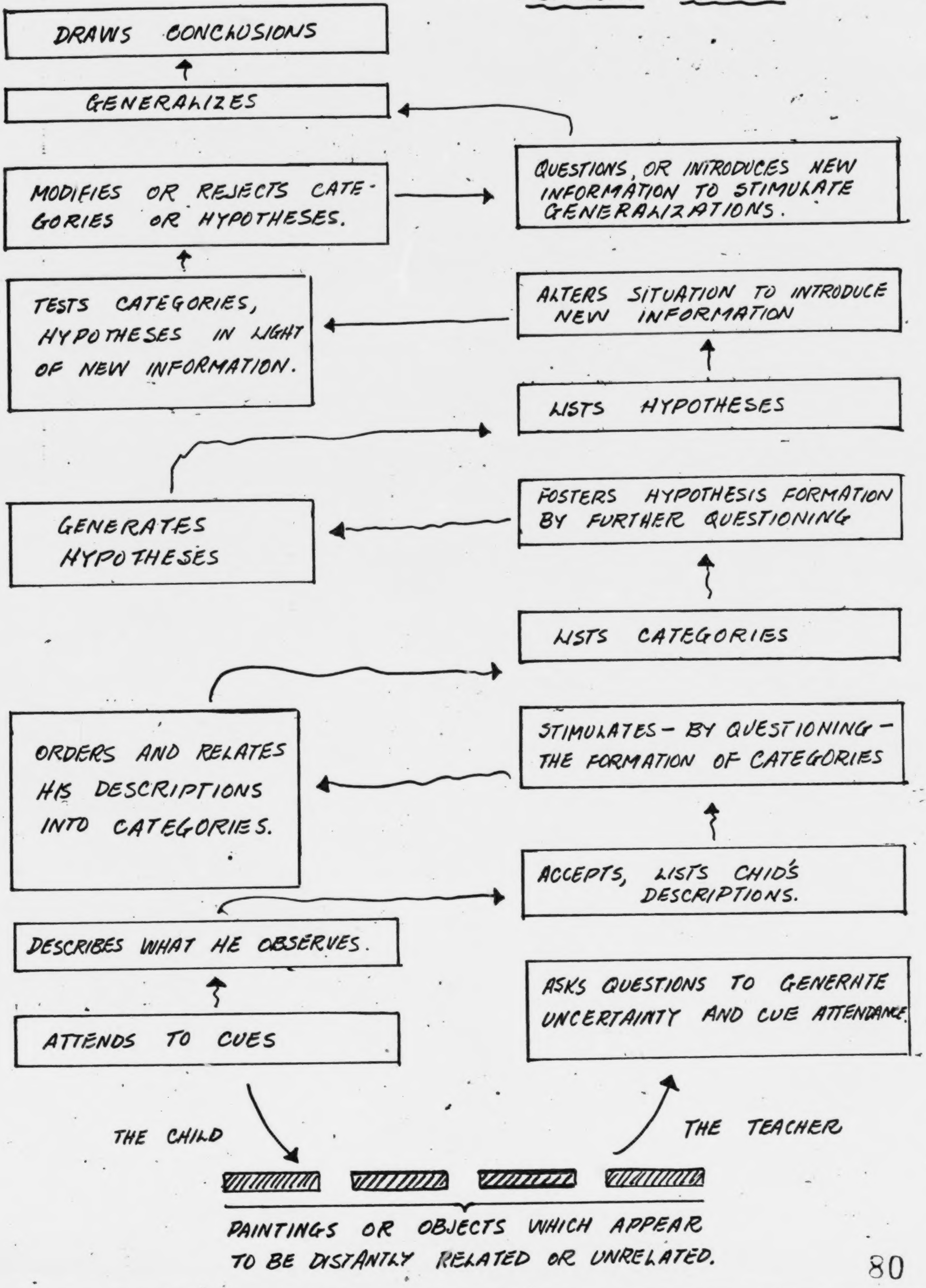
APPENDIX "ART"

Directions to students regarding meaning of "Don't Know" reasons:

"If you circle "Don't Know," also circle one of the numbers that follow, to explain why you don't know. The meanings of the numbers are:

1. You don't know, but you could find out from some other person in the world.
2. No one knows, but someone could find out.
3. No one knows how to find out the answer to this question.
4. This is a value statement. It is just the way someone feels about something. It is not true or false.
5. No one knows because it hasn't happened yet.

TEACHER - STUDENT INTERACTION PATTERN ~ REFLECTIVE THINKING.


DRAWS CONCLUSIONS
GENERALIZES
MODIFIES OR REJECTS CATEGORIES OR HYPOTHESES.
TESTS CATEGORIES, HYPOTHESES IN LIGHT OF NEW INFORMATION.
GENERATES HYPOTHESES
ORDERS AND RELATES HIS DESCRIPTIONS INTO CATEGORIES.
DESCRIBES WHAT HE OBSERVES.
ATTENDS TO CUES
QUESTIONS, OR INTRODUCES NEW INFORMATION TO STIMULATE GENERALIZATIONS.
ALTERS SITUATION TO INTRODUCE NEW INFORMATION
LISTS HYPOTHESES
FOSTERS HYPOTHESIS FORMATION BY FURTHER QUESTIONING
LISTS CATEGORIES
STIMULATES - BY QUESTIONING - THE FORMATION OF CATEGORIES
ACCEPTS, LISTS CHID'S DESCRIPTIONS.
ASKS QUESTIONS TO GENERATE UNCERTAINTY AND CUE ATTENDANCE.
THE CHILD
THE TEACHER
PAINTINGS OR OBJECTS WHICH APPEAR TO BE DISTANTLY RELATED OR UNRELATED.

APPENDIX F

Some verbal and nonverbal dimensions of warranted uncertainty in classroom situations

The psychological concept of uncertainty is being adapted for use in classroom teaching or, more accurately, for teachers and students to use in learning situations. J. Sieber (1969) defines uncertainty as "the awareness of two or more possible courses of action, each of which is considered likely but not certain to lead to a suitable solution. The more choices one considers, the more uncertain one tends to feel."

Warranted uncertainty can best be used in a classroom after awareness of its various dimensions. Since these dimensions can be conceptualized in a rough hierarchy, a teacher will begin teaching the concept at the level that best matches the children's ability to use and understand it. Here are some specific, although not inclusive, dimensions. First, a teacher must reduce kinds of "certainty" which would otherwise impede appropriate use of uncertainty: 1) "knowing" something that is not so, i.e., Columbus was the first man to discover America; 2) using an oversimplified concept, i.e., the North fought the civil war to free the slaves; 3) having a limited range of experience that leads to a false generalization, i.e., All animals that bark are "dogs"; 4) using an inaccurate process of thinking, i.e., 2 + 2 = 4 in base 5 notation; 5) maintaining a belief system that accepts the coexistance of contradictions, i.e., "The highest form of government is a democracy and the highest form of democracy is a government run by those who are most intelligent" (from Rokeach, The Open and Closed Mind); 6) having value judgments or personal attitudes are used unknowingly in developing a generalization, i.e., Civilization has developed to its greatest heights in the 20th century.

Next, there are kinds of certainties that are warranted:
1) cue attendance, an "appropriate" certainty taught as a tool for building higher-level thinking.
2) knowledge of facts, equations, and algorithms; these are tools for processing information;
3) ability to read, write, and cipher; although these may be taught using some uncertainty concepts, it will be assumed here

that students can use these as tools in higher-level thinking.

Third, some examples of warranted uncertainties. No attempt has been made to place them in an appropriate hierarchy for they are, in effect, labels that teachers and students can use when explaining why they cannot be certain about some idea or topic:

1) lacking sufficient experience for making generalizations;

2) lacking necessary information-processes for making hypotheses;

3) knowing that the generalization is a hypothesis may be altered by experience, new information, or time;

4) knowing that the information is unknown and may never be known;

5) knowing that the generalization is a value judgment or a personal attitude and is not believed by everyone.

Fourth, a hierarchy of warranted uncertainty; a teacher would encourage responses of the lower order categories first (adapted from Taba (1967):

1) seeking enumeration responses, i.e., Are there any other colors you see in all these paintings?

2) seeking grouping responses, i.e., What can you think of that fits into this category?

3) seeking labeling for groups, i.e., What might we call all of these things we just wrote down?

4) seeking information that relates, compares, or contrasts data, i.e., How are these things different from each other?

5) seeking an inferential explanation, i.e., Why would you feel happy about doing that?

6) seeking a generalization, i.e., Why do you think all of these things work in the same way?

7) seeking analogies, i.e., Can you think of some other topic or idea that has the same structure?

8) seeking a generalization of a generalization, i.e., Can you draw any conclusions at this point based on the evidence and the generalizations we now have?

In a nonverbal level these dimensions are important for a teacher who is using warranted uncertainty:

1) Assess (roughly) the amount of anxiety each student exhibits and vary the use of nonverbal techniques accordingly. The more anxious students will need more teacher-supportive behaviors, modeling of a more relaxed stance, and frequent approvals for accepting some uncertainty.

2) When teaching uncertainty concepts, develop an attentive, listening stance. Focus directly on the student while he is using uncertainty, make no distracting body movements, and remain attentive until he finishes speaking. Check to make sure your body and facial muscles feel relaxed.

3) When asking questions to generate uncertainty, do not be in a hurry. Do not look immediately at the students; pause, remaining motionless so that you do not distract them from thinking, then search faces and eyes of students slowly. A nonverbal response can often be detected because a student's facial expression will change. Do not call on students; if no one responds, assume you asked a bad or poorly worded question. Try rephrasing the question.

4) Use uncertainty when speaking. Ask the students' opinion of your statements or definitions. Nonverbally, place yourself near the students. Do not put furniture between yourself and the students. Sit with them in their circle during discussions, not apart or at a higher level.

5) Value and encourage student interactions while they are generating hypotheses. Place the students in an arrangement that allows them to see each others' faces. Determine what the most size group would be. It may vary depending on the subject of discussion, teaching style of the teacher or the background experience of the students.

6) Be aware of the point when children tire and stop the activity before it ceases to be rewarding. Offer activities next that allow some exercise of large muscles if students are tense as a result of intense preoccupation with cognitive stimuli.

In conclusion, then, what are some of the goals and means of educating persons to recognize when it is appropriate to be uncertain: One goal is to reduce children's use of inappropriate certitude. Some means of accomplishing this goal are to:

1) Provide experience with situations which are difficult to explain and develop in students habits of acquiring relevant information.

2) Promote discussions that extend students ideas, opinions, or feelings about such situations.

3) Describe goals and let the children discover plausable ways of arriving at the goals.

4) Help children separate values, attitudes, or beliefs from rational arguments or facts.

5) Give verbal and nonverbal assurances that "don't know" is an acceptable response.

Another goal is to teach children to be aware of the kinds of uncertainty that exist. Means for achieving this goal include:

1) Model appropriate uncertainty and explain the kinds of uncertainty. Modeling can be done by the teacher or a high-status student.

2) Use a scale that allows "true", "false", and various forms of "don't know" on tests.

3) Allow students to underline words or concepts they are not sure of and use a varied scoring system which avoids a heavy penalty for guessing.

4) Provide extensive hypothesis-generating experience in the classroom to help children recognize when information is insufficient for making generalizations.

A third goal is to develop student competency in using uncertainty. The means to this might include:

1) Provide guessing experiences, encourage educated guessing.

2) Give practice in cue attendance.

3) Provide experience in projects or discussions where no single answer is correct.

A fourth goal is to support and strengthen the value of warranted uncertainty. Means to achieve this might be to:

1) Give examples of situations when creative people have used uncertainty concepts to solve difficult problems.

2) Help the student to understand that some (testing) situations require "certain" responses.

3) Reward students when they use uncertainty concepts.

4) Point out occasions when the use of uncertainty was beneficial to a student.

AN OBSERVATIONAL SCHEME FOR THE MEASUREMENT OF WARRANTED UNCERTAINTY IN THE CLASSROOM

The observation scheme chosen is global, i.e., it attempts to categorize all student and teacher verbal behavior. It is specific enough (hopefully) to allow comparisons of teachers, student groups, or subject matter with warranted uncertainty concepts used as a variable. The categories, drawn primarily from Wright's observation category scheme which has been thoroughly tested, are well-separated and defined. The scheme is set up in a matrix to allow convenient cross-comparisons of a variety of data and grouping of data. The categories differentiate important aspects of teaching techniques which are likely to permit, encourage or discourage student responses of uncertainty. Analyses of some of these dimensions whould help pinpoint appropriate directions for the application of warranted uncertainty to the classroom.

Classification Scheme for Observing Warranted Uncertainty in Classrooms (adapted from Wright (1961), Taba (1967), and Withall (1949).

Teacher behavior or responses

1. Clarifying, encouraging, nonverbal
    - 1.1 approving student's comments
    - 1.2 encouraging pupil to develop own ideas
    - 1.3 amplifying pupil's response
    - 1.4 repeating a student's response
2. Contacting, checking
    - 2.1 checking pupil's understanding
    - 2.2 rehtorical questions and answers
    - 2.3 passive question requiring simple passive answer
    - 2.4 question anticipating one-step or trivial answer
    - 2.5 drill
    - 2.6 request for information requiring simple recall or reading
    - 2.7 request for cue attending response

3. Confronting, seeking, grouping
    - 3.1 statements requiring extensive participation such as multiple answers or responses
    - 3.2 questions requiring independent thought
    - 3.3 request for one-step answer that requires selection and organization of material
    - 3.4 statement eliciting pupil judgment accompanied by evidence
    - 3.5 request for grouping (organizing into categories)
    - 3.6 request for categorization (labeling)
    - 3.7 statements that generate uncertainty

4. Soft or hard challenging, jolting
    - 4.1 request for categorization of a single item in more than one category
    - 4.2 requesting inferences, generalizations, hypotheses generation
    - 4.3 request for application of generalizations
    - 4.4 questions that elicit "grand leap" in hypothesis generation
    - 4.5 absurd remarks which require significant thought, structuring before responding
    - 4.6 controversial questions that require cognitive restructuring

5. Informing, lecturing
    - 5.1 giving answers to pupil's question
    - 5.2 explaining pupil's answer
    - 5.3 stating facts
    - 5.4 reading material or giving answers
    - 5.5 summarizing lesson or information discussed

6. Directing
    - 6.1 explaining or directing work
    - 6.2 instructing use of material or kinds of responses to make

7. Reproving, disapproving, disparaging
    - 7.1 admonishing student for unacceptable behavior
    - 7.2 statements which remind student of cultural norms or values
    - 7.3 statements which describe student's unacceptable achievement

8. Teacher-supportive
    - 8.1 assertion of personal belief or opinion
    - 8.2 reference to present or past interests, activities, possessions
    - 8.3 justification or defense of a position or opinion or belief

Pupil behavior or responses

9. Receptive, passive, low-level responses
    - 9.1 enumeration of specific information (cue attendance)
    - 9.2 giving specific units of data
    - 9.3 reading book or book answers
    - 9.4 answering "I don't know" with no explanation
    - 9.5 use of simple recall of information
    - 9.6 grouping without an explanation
    - 9.7 guess from one cue

10. Independent, active, intermediate-level responses
    - 10.1 giving inferences from units of data
    - 10.2 making a hypothesis
    - 10.3 providing a factual explanation
    - 10.4 subsuming of items in a category with a stated reason or explanation
    - 10.5 relating, comparing, contrasting units of data
    - 10.6 making witty remards related to topic
    - 10.7 making a generalization
    - 10.8 making guesses from multiple cues
    - 10.9 answering "I don't know" with an explanation

11. High-level response, creative, curious
    - 11.1 drawing analogies
    - 11.2 giving an inference that is a generalization upon a generalization
    - 11.3 presentation of a new topic with explanation
    - 11.4 original or unusual application of topic
    - 11.5 an elegant solution (original or concise, of a higher level than other solutions discussed)

    11.6 testing a hypothesis
    11.7 disconfirming a hypothesis with an explanation

General

12. Silence, confusion, organization
    12.1 first and last entry in each daily classification
    12.2 writing or reading without comment
    12.3 confusion, teacher not directing
    12.4 recording of data, homework, grades
    12.5 student behavior which disrupts class

~~9~~ 11 10

An exercise that helps to think about nonverbal behaviors.

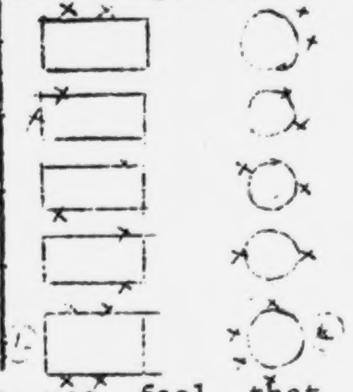
What can you say with nonverbal motions or gestures that describes

1. anger or annoyance
2. support or approval
3. an uncertain feeling or idea
4. certainty or emphasis
5. encouragement for student to say more or explore.

What kinds of room arrangements best facilitate these interactions?

1. Cooperative behavior
2. Conversation
3. Co-acting
4. Competition
5. Group with one leader

Seating arrangements of College Students



What can you say with objects - things to look at, use, feel, that promote uncertainty?

1. lesson in study of insects
2. history lesson about Chinese-Americans since 1850
3. art lesson in figure drawing
4. geography lesson in countries of Asia
5. math project with 3 - dimensional objects.

APPENDIX G

Examples of Evaluation Procedures for Measuring Ability to Recognize When it is Warranted to be Uncertain

Uncertainty in History

The following text includes notes and observations made in connection with the development and teaching of a history lesson encouraging uncertainty.

1. Why accounts of history can be different.
    - A. Different people can interpret what they see and hear differently.
    - B. Different people will record only the facts that they think are important.
    - C. When a story is heard only in part, the missing parts are either:
        1. Fabricated to make the story complete.
        2. Left out, leaving the story incomplete.
    - D. Events that are not documented immediately rapidly change content in one of the following ways:
        1. Eyewitnesses' accounts of events become distorted when information is passed by word of mouth, it tends to get changed.

II. Conflicting ideas are best developed by:
- A. Asking kids to discuss and defent their ideas.
- B. Getting models to take different positions.
- C. Use of questions:
    1. Give two interpretations of an event.
    2. "True - false, don't know for sure," type questions.
    3. What questions would you ask to find out.

D. Assignment, refer to information in text.

  1. Find conflicting reports.
  2. Criticize source of information.
     a. How did author make inferences?
     b. Where did facts come from?
     c. What other interpretations are possible?

E. The Asch test.

  1. Divide class into two groups.
  2. Motivate each group to develop differing views on a topic.
  3. Divide existing groups in half, regroup, and have each new group discuss their ideas.

F. Use five item, don't know scale.

G. Present model with alternative views.

  1. Train high-prestige students.
  2. Teacher as model.
  3. Tape recording of child.
  4. Movie or video-tape of child.

H. Present visual information (movies without sound, pictures, field trips).

  1. Require individuals to supply as many explanations as possible about what they saw.
  2. Small groups devise own explanations then compare with other groups.
  3. Encourage different explanations within a single group.

I. Cue Attendance.

With these ideas in mind, I proceed with the following experiment. A class of fourth-graders was split into two groups, one an experimental group, one a control group. The groups were split up so that there were slow and bright students in each group. The experimental design was as follows:

> The experimental group received uncertainty training while the control group received no training. Both groups were then trained in the use of a five point uncertainty scale (such as that described in "Lessons on Uncertainty"). Once they were both familiar with this kind of testing, and the experimental training had been completed, a post-test was given. (Copies of the training material ad post-test are included at the end of this report.)

Training. The experimental training began with a game called gossip or telephone. It is played in the following manner: I repeat one sentence (about anything) to one person in the class and that person whispers it to the next person and so on until everyone in the room has heard the story. When the game concludes, I ask the last person to repeat what he heard, ask the first person if that is what I told him. Then after they both have repeated their versions of the sentence, we spent time pointing out the differences between the two sentences. The students were able to point out all the differences between the two sentences. We then tried to determine why the sentence had changed.

The reasons that the kids themselves gave were:

1. Could not understand
2. Talked too fast
3. Could not hear
4. Something was left out
5. Something was forgotten
6. Getting interrupted

After these points were disucssed, I made the general point that because a story like this can change, one cannot accept and believe everything he hears; there is always the chance that it could have changed for one of the above six reasons.

It is important to note that it was the student not the teacher who presented the reasons for the changes in the gossip game. In this way the instructor knows that he is getting through to the students; such feedback from the students is important.

The training was continued with the example of two students attending a movie. The situation was presented as follows: John like the movie and Jane did not like it. Now if John was the only one to come to class the day after the movie, the entire class would probably think the movie was good because that is the only opinion we heard. However, if Jane was the only one to come back the day after the movie, everyone in the class would think that the movie was lousy. At this point, I tried to show them that because there is the possibility of two differing opinions about the same thing, you cannot accept just one opinion as being the true interpretation of the movie. Then we went on to say that if Both John and Jane came back to school the day after the movie the people in the class would be uncertain as to whether the movie was good or bad because there are two differing opinions being presented at the same time. In this case they could do one of two things: they could either go see the movie themselves and form their own opinion or they could believe one person or the other depending on his reasons why the movie was good or bad.

Training was continued by presenting to the experimental group different accounts of finding gold at Sutter's Mill in 1948 (see training material at end of report). In these different accounts, such things as the exact date of the discovery of gold were shown to be different. Similarities among the accounts were also pointed out. It was then emphasiced that the degree to which one can be certain depends on the number of similar or conflicting reports.

Since the material that I was presenting was on the same subject as their text book, I found it very difficult to convince the students that their text book might be wrong. For instance; after presenting many conflicting accounts, concerning the exact date of the discovery of gold, I asked the class which date is the correct date of the discovery of gold. The answer that I got from one student was, "The 24th of January 1948 because that's what out text book says". In a few cases I think I was able to get them to start to question the text book. But in the short period of time that I had to work with them it was extremely difficult to convey that the text book might be wrong.

Conclusions. Very few conclusions can be drawn at this point since the results of the experiments have not been statistically represented yet. However, a few inferences can be made.

1. The students who had the uncertainty training tended to be more unsure of their answers in the post-test than those students in the control group.
2. The students in the experimental group were able to give valid reasons why they were unsure whereas those in the control group did not give as good reasons.
3. Those in the control group frequently said they were completely sure because the text book said so.

Training on the Use of Uncertainty Test

Directions:

On the answer sheet, write your answer and say how sure you are that the answer is correct.

1. What is the weather going to be like tomorrow?
2. What is your name?
3. What is the exact date that a man will land on the moon?
4. Will you pass the fourth grade?
5. Will everyone in the room pass?
6. Will the world be here tomorrow?
7. How many days are there is a week?
8. How many tetherball poles are there in the Slater School playground?
9. Will a man ever land on the moon?
10. How much water is in the Pacific Ocean?

SET #1

by James W. Marshall

On or about the 19th of January -- I am not quite certain of the exact day, but it was between the 18th and 20th -- I went to the race as usual. Near the lower end of the race, on a rock about six inches below the surface of the water, I discovered the gold.

---

by John Bidwell

As a habit, John Marshall would go down to the race in the morning to see where it needed deeping. On one morning in January of 1848, Mr. Marshall saw a piece of gold in the race where the running water had washed away the lighter material.

---

by Henry W. Bigler -- helped build the sawmill

On the 24th of January, 1848, James Marshall discovered gold in the race of Sutter's mill. On the 30th of January, we picked up almost a hundred dollars worth of gold last week.

by Joseph L. Folsom

This envelope contains the first piece of gold ever discovered in the northern part of California. It was found in February 1848 by James W. Marshall in the race of Captain John Sutter's sawmill.

SET #2

by James W. Marshall

Mrs. Wimmer was my treasurer. She used four hundred and forty dollars of my money to make a purchase. Included in the four hundred and forty dollars was the first piece of gold which I had found. Where that went, or where it is now, I believe nobody knows.

---

by John A. Sutter

Mrs. Wimmer possess a piece of the earliest found gold. It was given to her by James Marshall.

---

by Joseph L. Folsom

This envelope contains the first piece of gold ever discovered in the northern part of California. It was found in February 1848 by James W. Marshall in the race of Captain John Sutter's sawmill.

SET #3

by John A. Sutter

I told them that I would get a ring made of this gold as soon as it could be done in California; and I have had a heavy ring made with my family coat of arms engraved on the outside.

---

by Azariah Smith-- helped build the sawmill.

Sunday, February the 6th, Mr. Marshall has returned with the fact that it is Gold; Captain Sutter came here Wednesday for the purpose of looking at the mine where the gold is found; and got enough for a ring.

SET #4

by James W. Marshall

About the 20th of Fenruary, 1848, Captain Sutter came to Coloma for the first time.

---

by Azariah Smith -- helped build the sawmill

Sunday February 6th Mr. Marshall returned with the fact that it is Gold; and Captain Sutter came here Wednesday, for the purpose of looking at the mine, where the gold is found.

---

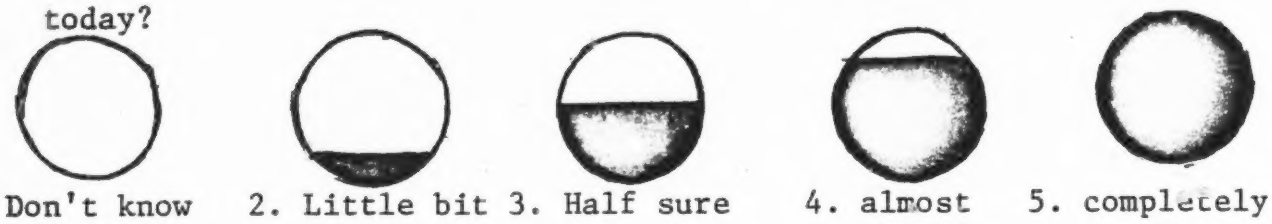
by John A. Sutter

After showing me the gold, Mr. Marshall left for Coloma. I left for Coloma the next morning. Because of weather, I stopped overnight at Eldorado. The following morning I went to the race and saw the gold.

Post-test

THE GOLD RUSH

Example: The sun is out today, how sure are you that the sun it out today?


1. Don't know at all
2. Little bit sure
3. Half sure
4. almost completely sure
5. completely sure

Explain your answer:

I SAW THE SUN

Example: The sun will be out tomorrow. How sure are you that the sun will be out tomorrow?

1 2 3 4 5

Explain your answer:

BECAUSE THE WEATHERMAN SAID IT WILL BE SUNNY, BUT HE MIGHT BE WRONG

1. It says in your textbook that James Marshall came back to camp after he found gold and said, "Boys, I believe I've found a gold mine." How sure are you that James Marshall said that?

   1 2 3 4 5

Explain your answer:

2. It says in your textbook that, "Marshall's gold was turning San Francisco into a ghost town." How sure are you that the gold was turning san San Francisco into a ghost town?

   1 2 3 4 5

Explain your answer:

3. It says in your textbook that,"A man who had learned about gold mining in Georgia showed how to use a pan for mining it." How sure are you that the man was from Georgia?

   1 2 3 4 5

   Explain your answer:

4. It says in your textbook that, "Panning was a good way to test for gold, but a slow way to wash much dirt." How sure are you that panning was good but slow?

   1 2 3 4 5

   Explain your answer:

5. It says in your textbook that, "A miner of 1848 tells about a breakfast for two at Coloma. They had a box of sardines, hard bread, butter, cheese, and two bottles of ale. The bill was forty-three dollars." How sure are you that the bill was forty-three dollars?

   1 2 3 4 5

   Explain your answer:

6. It says in your textbook that, "Most Americans setting out for the Gold fields chose to go overland." How sure are you that they chose to go overland?

   1 2 3 4 5

   Explain your answer:

7. It says in your textbook that, "A great many of the men were homesick." How sure are you that there were many homesick?

1 2 3 4 5

Explain your answer:

____

____

8. It says in your textbook that, "As a gift to everyone at the mill, Sutter handed out knives." How sure are you that he handed out knives to everyone?

1 2 3 4 5

Explain your answer:

a____

____

9. It says in your textbook that, "Sutter's men began to quit so they could hunt for gold." How sure are you that they quit to look for gold?

1 2 3 4 5

Explain your answer:

____

____

10. It says in your textbook that, "The river water was icy." How sure are you that the water was icy?

1 2 3 4 5

Explain your answer:

____

____

Abilities:

1. Given information and a question related to that information, the student should be able to tell whether he has adequate information to answer the question and if he doesn't have adequate information he should be able to state that this is either because:

(1) He doesn't know but could find out from some other person in the world.

(2) He doesn't know but someone could find out.

(3) No one knows how to find out the answer to this question.

(4) The problem concerns a value statement. It is just the way someone feels about something . It is neither true nor false, nor can one draw any conclusions from it.

(5) No one knows because it hasn't happened yet.

(6) He doesn't know the answer and doesn't know whether or not any one else in the world knows the answer or how to find out the answer.

Examples of statements which are true, false or not known:

(1) One plus one equal two. (This mathematical equation is always true.)

(2) There are 25 hours in one day. (This statement is false, because there are always 24 hours in one day.)

(3) The population of Waterville, Maine is 53,120. (You don't know, but someone who works in Waterville's City Hall probably does.)

(4) There were 5,021,938 words printed in the New York Times newspaper today. (Nobody bothered to count, but if you wanted to find out, you could always count the words yourself.)

(5) Camels like rock-and-roll better than opera. (This could be true, but since we cannot ask camels, we cannot know for sure.)

(6) Michelangelo was the greatest painter that ever lived. (Though some people think so, others disagree. It is really a matter of opinion, neither true nor false.)

(7) The U. S. will land a man on the moon this year. (Even if some people think that this is likely, we cannot know for sure since it hasn't happened yet.)

Uncertainty Concept Formation

I "Ask me a question I don't know the answer to." When an When an appropriate question has been asked, explain why you don't know.

II Ask the child a question requiring the same type of don't know response as above. Explain the similarities between the two questions, after he has said "I don't know."

III Explain the six types of don't know responses. Give examples. Have the child give examples, continually point out that "I don't know" is not only an adequate response but the correct one.

Types of don't know responses

1. You don't know but you could find out from some other person in the world.
2. No one knows but someone could find out.
3. No one knows how to find out the answer to this question.
4. This is a value statement. It is just the way someone feels about something. It is not true or false.
5. No one knows because it hasn't happened yet.
6. You don't know and you don't know whether anyone else in the world knows.

"Don't Know" Questions Used in Training

1. You don't know, but someone else does.
    - A. What is my middle name?
    - B. How tall is the flag-pole?
    - C. Who was the 10th President of the United States?
    - D. How many kids go to your school?

2. No one knows, but the answer is knowable.
    - A. How much jello does it take to fill a basketball?
    - B. How many words were there in today's newspaper?
    - C. How many words in the dictionary end with a "y"?
    - D. How wide is your thumb?

3. Nobody knows, and we can't find out.
    - A. How many stars are there in the universe?
    - B. How much sand is there on the earth?
    - C. What is the cure for the common cold?
    - D. Is there intelligent life on other planets?

4. It is not knowable - subjective.
    - A. What is the best tasting food?
    - B. Is the Mona Lisa the greatest painting in the world?
    - C. Is summer or winter the nicest time of year?
    - D. Is tiddly-winks more fun than jacks?

5. It is not knowable - concerns future events.
    - A. How tall will you be when you grow up?
    - B. Will the U.S. put a man on the moon this year?
    - C. Who will be our president in 2001?
    - D. When will the Giants win a pennant?

Look at a globe of the earth. How can the location of Japan on the globe be explained? In order to explain the location, first find the line that is half-way between the North Pole and the South Pole. This line circles the globe in an east-west direction. It is called the equator.

The equator divides the earth into two equal parts. These equal parts are called the northern hemisphere and the southern hemisphere. Hemisphere means half of a sphere or ball.

Other lines that run around the globe in an east-west direction are called parallels. They run parallel to, or even with, the equator. Some of the parallels have special names.

Turn the globe until you find the Pacific Ocean. Place your finger on the equator in the middle of the Pacific Ocean. Move your finger slowly toward the North Pole until you find the first dotted line which runs in an east-west direction around the globe. The special name of this parallel line is the Tropic of Cancer.

Japan might be called a nation of "farmers of the sea." Because there is very little land on which one can raise livestock, the Japanese people have turned to the sea for other kinds of food. The total Japanese fishing catch is the biggest in the world. Japan sells fish to many other countries. Most of the fish that is sold, or exported, to other countries is canned or smoked, although some of it is frozen.

Because Japan's fishing industry is so important, it has been modernized with radar and fish shoal detectors. Helicopters are also used to help fishermen locate schools, or large groups, of fish. This modern equipment is used mostly on large fishing ships.

Almost every village along the shores of Japan has its own fishing fleet which is made up of small boats that are owned by individual fishermen. Usually these fishermen go out together with their boats. They are able to make better catches and they can sell their fish for higher prices than if each person worked alone. You can see in the picture below that the people are working together to unload the catch from one fisherman's boat. How far out to sea do you think these boats can go? Compare the boats with those shown on page 81

The making of textiles is another leading industry in Japan. Although most of the raw cotton that is needed has to be brought from other countries, cotton cloth and yarn are Japan's second largest export. Great textile mills spin the raw cotton into thread and yarn. The picture below shows cotton thread being woven into cotton cloth on large looms. The Japanese woman in the picture is repairing a break in the thread. When the cloth is finished, it is rolled into large rolls or bolts. Much of this cotton cloth is sold to the United States where it is made into bed sheets, clothing, and many other things.

Electrical household appliances, such as sewing machines and washing machines, are made by many Japanese manufacturing companies. These appliances are shipped to many other countries. Since Japanese homes are rapidly becoming modernized, many housewives are using electrical home appliances. There are farm homes which have electricity too, now that Japan has harnessed many of its rivers to make hydro-electric power. In this picture you can see the interior of a Japanese washing machine factory where both men and women are working.

Craftsmen still make many of Japan's finest art objects by hand. Silk cloth, pottery, and objects of wood and metal are the most important things that are made by hand.

Sometimes everyone in a village is engaged in making the same kind of thing. Such a village is Hirasawa, located in the high mountains of central Japan. Every family in this village makes lacquerware. Find Hirasawa on a map of Japan.

The art of making lacquerware has been carried on by the families of Hirasawa for many, many years. Children learn the skill from their parents. The lacquerware is made in the homes of the people. This kind of manufacturing is called a workshop, or a "cottage," industry.

Lacquer is tapped from a certain kind of tree in the same way that rubber is tapped from a rubber tree. The sap is mixed with iron powder and with other minerals to make it look black or red. The best quality of lacquer is jet black. As many as 35 coats of this mixture may be used on a wood base. For the best quality of lacquerware, cypress wood is used. After each coat of lacquer, the object is put aside to dry for a long time. When the object is finished, it is very glossy.

The newest type of lacquerware is made with a steel or aluminum instead of wood base. The picture below shows some lacquerware bowls in which food can be served.

Many Japanese people work at weaving silk cloth, particularly in the city of Kyoto. Some kinds of silk cloth are soft and light. Other kinds, such as satin and brocade, are heavier. Some kinds have beautiful designs woven into them. These designs are another form of Jananese art expression.

Although most of Japan's silk cloth is made on power looms in factories, some silk cloth is still made by hand in Japanese home industries.

Salt, when dissolved in water, gathers into atoms called ions. The salts in brackish water are divided into two types of ions: sodium ions carrying a positive electrical charge and chloride ions carrying a negative charge. Direct electrical current is made to flow through the brackish water, and each of the two poles is connected to separate metal plates. One electrical plate has a negative electrical charge. The other plate has a positive electrical charge. The positive sodium ions are attracted by the negative plate. The negative chloride ions are attracted by the positive plate. Between these two electrically charged plates are two special types of membranes. One membrane allows only sodium to pass while the other allows only chloride to pass. When the electrical charges are operating, brackish water will separate in three directions. The waters of sodium-charged ions go in one direction; the waters of chloride-charged ions go in another direction. The remaining fresh water moves downward through the converter.

One huncred years ago the prospector and his burro were all that was needed. There was no ever-increasing demand for metal as there is today. Unfortunately, today's demands for more metals cannot be fulfilled even by prospectors in fast-moving aircraft or hardy jeeps. Our nation is simply exhausting its supply of mineral resources. In fifty years, copper may become as scarce as gold. Where will our nation find the mineral resources that it will need for homes, automobiles, and giant factories? We cannot dig deeper pits or shafts into the earth for the needed minerals or bargain with other countries for them. We may have another source that few miners have considered: the sea.

How did the sea become a storehouse of minerals? No one can be certain how the planet earth was created. Men can have only theories. Despite many other theories, most scientists believe that the creation of the earth took place nearly four billion years ago. We shall not be concerned with the earth's creation; only that at one time, water formed upon the earth and rain began to fall. Since then, relentless rains have eroded away great mountains, created huge canyons, and moved vast amounts of rock and minerals to the ocean. There, the rain-washed minerals joined materials from countless volcanoes and meteorite materials from outer space.

It is impossible to determine the amount of minerals which have eroded and flowed into the sea over the ages. Scientists estimate that over four billion tons of dissolved materials flow from the land to the sea each year. Over the ages, the oceans have become a giant storehouse of mineral riches.

DIRECTIONS #1

On page 2 and 3 you will find 16 sentences that say something about your school. Some of these sentences are true, some are false, and some you won't know the answer to. Circle True, False, or Don't Know, depending on whether you think the sentence is true, false, or you don't know. Do not mark any of the numbers that come after Don't Know. Some of the sentences may sound silly, but please think carefully before you mark your answers.

SAMPLE SENTENCES

1. One plus one equals two.

True False Don't Know 1 2 3 4 5

(This arithmetic answer is always true.)

2. School starts at 10:30 in the morning.

True False Don't Know 1 2 3 4 5

(This sentence is false because school starts earlier than 10:30.)

3. The bike racks at your school hold 367 bikes when they are full.

True False Don't Know 1 2 3 4 5

(You don't know because you have probably never counted them.)

Now turn to page 2 and mark the sentences in the same way you marked the "Sample Sentences".

SENTENCES ABOUT YOUR SCHOOL

1. Your math book has written words in it.

   True False Don't Know 1 2 3 4 5

2. Your school has a Principal.

   True False Don't Know 1 2 3 4 5

3. The school secretary lived in Big Bend, Montana for one year.

   True False Don't Know 1 2 3 4 5

4. Last week the wind blew 379 pieces of paper out of the school yard.

   True False Don't Know 1 2 3 4 5

5. 3 windows were broken in your school last September.

   True False Don't Know 1 2 3 4 5

6. Everyone in your school does homework 10 hours each night.

   True False Don't Know 1 2 3 4 5

7. Since your school was built, more black dogs than brown dogs have walked across the school playground.

   True False Don't Know 1 2 3 4 5

8. Your class plays kickball everyday.

   True False Don't Know 1 2 3 4 5

9. It is more important to study about the life of President Lincoln than to study about the life of President Washington.

   True False Don't Know 1 2 3 4 5

10. If you ran as fast as you could, it would take 45 seconds to run from your classroom to the Principal's office.

    True False Don't Know 1 2 3 4 5

11. In 5 years there will be 1,520 books in the school library.

    True False Don't Know 1 2 3 4 5

12. Kickball is a better game than baseball.

True False Don't Know 1 2 3 4 5

13. A 1st grade boy is the kindergarten teacher.

True False Don't Know 1 2 3 4 5

14. Next year there will be 27 students in the 3rd grade.

True False Don't Know 1 2 3 4 5

15. The waste paper basket in your room can hold more than 560 pencils.

True False Don't Know 1 2 3 4 5

16. There are some women teachers in your school.

True False Don't Know 1 2 3 4 5

DIRECTIONS #2

It is perfectly all right not to know the answers to all questions, but often it is important to know why you don't know. Some reasons why people don't know the answers to questions are:

1. Someone doesn't know because he doesn't have enough information, but he could find out from some other person in the world who does know the answer now.
2. No one knows now, but someone could figure out how to find the answer if he really wanted to.
3. There is no way that anyone in the world will ever be able to find out the answer.
4. No one knows for sure because it is just the way someone feels about something. It is an opinion.
5. No one knows because it hasn't happened yet.

Tear off this page so you can look at the meanings of the numbers while we try some somple sentences on page 5.

On sentences that you circle Don't Know, also circle one of the numbers that comes after Don't Know. These numbers will tell the reasons why you didn't know the sentences were either true or false.

Remember the meaning of the numbers are:

1. Would have to find out from someone who knows.
2. Would have to find out how to find the answer.
3. ~~Will never know.~~
4. It's the way someone feels about something.
5. It hasn't happened yet.

SAMPLE "DON'T KNOW" SENTENCES

1. There are 32 children in your school who are staying home today because they are sick.

True False Don't Know 1 2 3 4 5

(You may not know, but someone who works in the Office has found out.)

2. There are 67,532 words printed in your reading book.

True False Don't Know 1 2 3 4 5

(Nobody has probably bothered to count, but if you wanted to find out you could always count the words yourself.)

3. Dinosaurs would have liked to listen to rock-and-roll music more than to nursery rhymes.

True False Don't Know 1 2 3 4 5

(This could be true, but since we cannot ask dinosaurs, we can never know for sure.)

4. Children learn more in music classes than in art classes.

True False Don't Know 1 2 3 4 5

(Though some people think so, others disagree. It is really a matter of opinion, neither true nor false.)

5. In about ten years from now, children will only have to go to school three hours each day.

True False Don't Know 1 2 3 4 5

(Even if some people think this may be true, we cannot know for sure since it hasn't happened yet.)

DIRECTIONS #3

Now go back to the sentences about your school. For every sentence that you circled "Don't Know", circle one of the numbers that comes after "Don't Know". The numbers you circle will tell the reasons why you didn't know if the sentences were true or false.

HERE ARE SOME SHORT STORIES. AFTER EACH STORY THERE IS AN ENDING OR A LAST PART. YOUR JOB WILL BE TO DECIDE IF THAT LAST PART IS RIGHT OR WRONG. YOU WILL READ THE STORY VERY CAREFULLY. BE CAREFUL TO SEE IF THERE IS ENOUGH INFORMATION OR IF WHAT YOU READ MAKES SENSE. THEN DECIDE IF THE LAST PART REALLY TELLS ABOUT THE STORY. SOMETIMES YOU WILL BE SURE THE LAST PART IS RIGHT OR YOU WILL BE SURE THAT THE LAST PART IS WRONG. PUT A MARK ON THE WORD "YES" IF YOU ARE SURE IT IS RIGHT AND ON THE WORD "NO" IF YOU ARE SURE IT IS WRONG. SOMETIMES YOU WILL NOT BE SURE. IF YOU ARE NOT SURE, PUT A MARK ON THE WORD "DON'T KNOW".

WHEN YOU HAVE DECIDED WHICH IS THE BEST ANSWER, PUT A MARK ON THE SENTENCE THAT TELLS HOW SURE YOU ARE.

NOW WE WILL PRACTICE ON THE FIRST STORY. READ THE STORY TO YOURSELVES AS I READ IT TO YOU. THEN READ THE ENDING. THEN GO BACK TO THE STORY TO SEE IF THE ENDING FITS THE STORY. WHEN YOU HAVE DECIDED, PUT A MARK ON THE SENTENCE THAT MATCHES WHAT YOU THINK.

Jill picked three leaves from an oak tree. All the leaves had sharp points.

Do no oak leaves have sharp points?

YES DON'T KNOW NO

Jack was reading about planets. He learned that earth is the only planet in our solar system that is not too cold or too hot for people to live on. He read that there are planets in other solar systems that scientists don't know anything about.

Is earth the only planet where people can live?

YES DON'T KNOW NO

Some people can throw balls well. The rest of the people cannot throw balls well.

There are some people who cannot throw balls well?

YES DON'T KNOW NO

After Paul finished supper, he went out to play ball with Jack. They played ball for two hours. Then Paul went to bed.

Did Paul eat supper after he played ball?

YES DON'T KNOW NO

Sally's mother is an artist. Sally can draw and paint. Sally is eleven years old.

Did Sally's mother teach sally some ways to draw?

YES DON'T KNOW NO

Jim likes to watch television. His favorite programs are all the sports events. Football is one sports event.

Does Jim like to watch football games?

YES DON'T KNOW NO

At 7:00, Buster heartd his mother get up. He was still sleepy but he got right out of bed.

Did Buster get out of bed at 9:00?

YES DON'T KNOW NO

Bud Collects old newspapers and sells them to the junkman. It is hard word but it is the only way Bud can earn some money.

Does Bud's family have much money?

YES DON'T KNOW NO

One day Sally cheated in the arithmetic test. The teacher caught her cheating and gave her a zero on her test.

Will Sally cheat on the next arithmetic test?

YES DON'T KNOW NO

The word "English" is English.

Is this sentence true?

YES DON'T KNOW NO

Most girls go to school. Some children are girls.

Do all children go to school?

YES DON'T KNOW NO

Henry was playing his radio so loud that he didn't hear his brother come in his room.

Did Henry's brother come in and take Henry's radio?

YES DON'T KNOW NO

One of the things that Jerry liked about the new school was that students were allowed to use the library often. He found many interesting books there.

Jerry likes to read books.

YES DON'T KNOW NO

Will climbed over the wall and sat down on the stairs. Jack, Bill, and Bob followed him. Will told the other boys what they should do next.

Was Will the leader of that group of boys?

YES DON'T KNOW NO

The Girl Scout Troup made cookies for the fair. Sally and Jane made cookies for the fair.

Are Sally and Jane Girl Scouts?

YES DON'T KNOW NO

Mrs. James keeps about 20 pounds of beans in the cupboard. When there is no money in the house, the family can eat beans. They have never run out of beans.

Do they always have something to eat?

YES DON'T KNOW NO

Jerry visited the dry dessert and looked at the sand and the prickly cacti. There was no water to be seen.

Are there any living things in the dessert?

YES DON'T KNOW NO

Jessie saw a weather map of United States. It showed that it was raining in the South. Then she went outdoors and looked at the blue sky. There were no clouds.

Does Jessie live in the south?

YES DON'T KNOW NO

Bud heard a fire siren one night and saw flames shooting into the sky.

Was there a house on fire?

YES DON'T KNOW NO

Billie Sue moved from Alabama to San Francisco. She had trouble getting used to the big city. In Alabama, she lived on a farm.

Did Billie Sue move from San Francisco to Alabama?

YES DON'T KNOW NO

After school, Jim walked with his friend Paul while Paul delivered the evening paper. Jim did not deliver the papers.

Does Jim have a paper route?

YES DON'T KNOW NO

The teacher listened to all the stories. She told the class that Betty's was the best.

Did the teacher listen to all the stories?

YES DON'T KNOW NO

When David was ten years old, he moved to California

Did David move to California in 1968?

YES DON'T KNOW NO

Jack's father is a football player. Jack can play football. He is on the school team.

Did Jack's father teach Jack some football plays?

YES DON'T KNOW NO

When the children finished school for the year, the Hills family loaded their station wagon and started on their summer vacation.

Were the Hills family going on a Christmas vacation?

YES DON'T KNOW NO

Billy looks for empty pop bottles almost every day. He gets two cents for each pop bottle he finds.

does Billy always find at least one pop bottle every day?

YES DON'T KNOW NO

Jenny wears the same dress to school for a whole week. The next week she wears another dress for a whole week.

Does Jenny have only two dresses?

YES DON'T KNOW NO

Some men and women cannot sew. Some men can sew.

Are there some women who cannot sew?

YES DON'T KNOW NO

Some boys and girls cannot ride bikes. Some boys and girls can ride bikes.

Can all boys ride bikes?

YES DON'T KNOW NO

The word "German" is German.

Is this sentence true?

YES DON'T KNOW NO

One day two men started a war. No one joined them.

Did the war end?

YES DON'T KNOW NO

On his way home from school Jack saw an old car parked next to the curb. It had no tires on it.

Did nobody want the car?

YES DON'T KNOW NO

The boy scouts hiked all morning. Most of them were tired when they stopped to have lunch. Jeff and Jim were two of the hikers who were tired.

were Jeff and Jim tired at lunchtime?

YES DON'T KNOW NO

Danny's bike ran into the side of a truck. Danny was not hurt. His bike was bent.

Did the accident happen because the truck turned the corner and didn't see Danny?

YES DON'T KNOW NO

Charles was reading a book about Mars. He found out that Mars may have water on it.

Are there living things on Mars?

YES DON'T KNOW NO

Jane found many round, smooth stones underneath a waterfall.

Those stones were probably smoothed by the falling water.

YES DON'T KNOW NO

Jane knows three people with blue eyes who wear glasses and nobody with brown eyes who wears glasses.

People with brown eyes have stronger eyes than people with blue eyes?

YES DON'T KNOW NO

Bruce saw five fire engines speeding past his house. Then he heard other fire sirens.

Was there a fire somewhere?

YES DON'T KNOW NO

Directions for Teaching the New Scoring System

1. Have the students clear their desks, take out a pencil and listen attentively.

2. USUALLY, WHEN YOU TAKE SPELLING TESTS, YOU GET POINTS FOR WORDS YOU SPELL RIGHT BUT NO POINTS FOR WORDS YOU SPELL WRONG. NOW, YOU ARE GOING TO LEARN A NEW WAY TO SCORE SPELLING WORDS. YOU WILL NEED TO UNDERSTAND THIS NEW WAY OF SCORING TO GET THE BEST POSSIBLE SCORE ON A TEST YOU WILL TAKE FOR PEOPLE FROM STANFORD UNIVERSITY.

3. I'M GOING TO PASS OUT A BOOKLET TO EACH OF YOU THAT WILL TEACH YOU THIS NEW WAY TO SCORE SPELLING WORDS. BY LEARNING THIS NEW WAY TO SCORE SPELLING WORDS YOU SHOULD BE ABLE TO GET A BETTER SCORE ON THE SPELLING TEST.

4. Pass out the booklets entitled "A new Way to Score Spelling Tests."

5. Have students turn to page one.

6. Read page 1 aloud to the students. (If you feel that many students will be unable to read through the booklet, you may go through the booklet orally. However, let students try to answer the questions by themselves.)

7. Upon completion of the booklets, collect the booklets and hand out the answer sheet entitled "Test for Scoring Words."

8. Be sure to have each student write his name on the answer sheet.

9. Upon the completion of the "Test for Scoring Words", if the students need a recess before taking the spelling test you may give them a few minutes break.

Directions for Giving the Test

1. NOW, YOU ARE GOING TO SPELL SOME WORDS FOR PEOPLE FROM STANFORD UNIVERSITY. THESE WORDS ARE NOT FROM YOUR REGULAR SPELLING LIST. SOME ARE EASY BUT SOME ARE VERY HARD. YOU WILL NOT BE GRADED ON THIS WORK, BUT YOU WILL BE GIVEN A SCORE SO DO YOUR BEST.

2. Pass out answer sheets entitled "Student Answer Sheets".

New scoring system - page 2

3. Have students write their names and today's date at the top of the answer sheets.

4. I'M GOING TO GIVE YOU SOME SPELLING WORDS. THE PEOPLE FROM STANFORD WILL SCORE YOUR SPELLING USING THE NEW WAY TO SCORE SPELLING WORDS. IF YOU THINK YOU MAY HAVE SPELLED A WORD WRONG, WHAT DO YOU WANT TO DO? (Solicit from the students the answer that they would want to circle a word they thought they might have spelled wrong.)

5. Give the students an example by writing the word   on the board. IF YOU THINK YOU MAY HAVE SPELLED THE WORD WRONG, DRAW A CIRCLE AROUND IT. Show the students by drawing a circle around   .

6. IF YOU DO NOT KNOW HOW TO SPELL A WORD, TRY TO SPELL IT AS WELL AS YOU CAN.

7. WE WILL PRACTICE ON THREE WORDS.

8. CAN ALL OF YOU FIND THE PLACE FOR WORD "A"? WRITE THE FIRST WORD I READ TO YOU NEXT TO LETTER "A". You may wish to write the letter "A' on on the board and indicate where the first word should be placed.

9. Dictate the following three words in the fashion you typically use

A.	DOG	THE DOG IS BARKING.
B.	SKIING	SNOOPY IS GOOD AT SKIING.
C.	PNEUMONIA	PNEUMONIA IS A DISEASE OF THE LUNGS.

10. HAVE YOU CIRCLED ALL THE WORDS YOU THINK MIGHT BE WRONG?

11. Teacher writes sample words spelled correctly on the board, and asks-- HOW MANY WERE NOT SURE HOW TO SPELL SKIING? DID YOU CIRCLE IT? THOSE WHO CIRCLED IT AND MISSPELLED IT GOT 2 POINTS. BUT THOSE WHO MISSPELLED IT AND DIDN"T CIRCLE IT GOT NO POINTS AT ALL. SO, REMEMBER TO CIRCLE WORDS IF YOU THINK YOU MISSPELLED THEM.

12. ARE THERE ANY QUESTIONS?

13. Dictate the list of 20 words in the fashion you typically use. The list of words is on the following page.

14. At the end of the test, teacher should remind students to check their spelling and circling and make sure their names and date are on the answer sheet.
15. Collect the papers and place them in the envelopes provided.

10/20/69

ESTIMATING CERTAINTY

NAME_________________________________ DATE ______________

Please reply to the following statments by putting a check (✓) in front of your answer.

Practice Question (for picture #1)

a. There is a little girl in the picture..

____ true

____ false

____ I don't know.

b. If you answered either "true" or "false", how sure are you that the answer you have given is correct? (do not answer this if you checked "I don't know.")

____ very sure

____ pretty sure

____ not sure at all

STOP HERE! DO NOT TURN THE PAGE UNTIL I TELL YOU TO.

#2

The following questions are for picture #2

1.

a. There are five people in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

2.

a. The boys are scared to go into the office.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

3.

a. Some of the boys have baseball gloves.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

4.

a. Two of the boys are brothers.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

5.

a. The boy with the glasses is going to go in to see about a job. (Notice the "Boy Wanted" sign on the door.)

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

6.

a. The boys want the boy with glasses to come play baseball with them.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

7.

a. All of the boys like to play baseball.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

8.

a. The boys are standing outside a grocery store.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

9.

a. The boy with the glasses is one year older than the other boys.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

10\.

a. None of the boys has a watch on.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

STOP HERE! DO NOT TURN THE PAGE UNTIL THE TEACHER TELLS YOU TO.

The following questions are for picture #3

1\.

a. There are some books in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

2\.

a. The boys stole the books.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

3\.

a. They are standing outside a library.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

4\.

a. The boys are going to take the books into the building.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

5\.

a. The books are overdue and they do not want to pay the fine.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

6\.

a. The boys have just come from school.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

#3

7\.

a. There are five boys in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

8\.

a. The boys are sitting.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

9\.

a. They boys are scared.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

10\.

a. The boys found the books on the ground.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

STOP HERE! DO NOT TURN THE PAGE UNTIL THE TEACHER TELLS YOU TO.

#4

The following questions are for picture #4

1.

a. There is a baseball bat in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

2.

a. The man is asking the boy, "Who broke the window?" (Notice the broken window.)

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

3.

a. The boy who broke the window is running away.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

4.

a. The man is going to call one of the boy's parents.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

5.

a. It is raining hard.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

6.

a. It is Saturday.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

7. a. There are no fences in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

8. a. The boys will get into trouble when they get home.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

9. a. The boy sitting down is lost and the man is giving him directions back to his house.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

10.

a. The boys like the man.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

STOP HERE! DO NOT TURN THE PAGE UNTIL THE TEACHERS TELLS YOU TO.

The following questions are for picture #5

1.

a. There is a dog in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

2.

a. The dog belongs to one of the boys.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

3.

a. The dog is dead.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

4.

a. The dog was hit by a car.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

5.

a. There are seven people in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

6.

a. The man is going to take the dog away in his truck.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

7.

a. The man wants to know how the dog was hurt.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

8.

a. All of the people in the picture like the dog.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

9.

a. It is a very hot day.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

10.

a. The woman is wearing black shoes.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

STOP HERE! DO NOT TURN THE PAGE UNTIL THE TEACHER TELLS YOU TO.

#6

The following questions are for picture #6

1.

a. There are some swings in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

2.

a. The people are moving out of their house.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

3.

a. The girl with the plant is asking if she can take it.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

4\.

a. The woman is angry with the girl holding the plant.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

5\.

a. There is a little girl sitting on the ground.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

6\.

a. All the people in the picture belong to the same family.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

7\.

a. The man and the woman are both carrying boxes.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

8\.

a. The people are hurrying because they are afraid it is going to rain.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

9\.

a. The girl likes the plant she is holding.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

10.

a. There is a house in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

STOP HERE! DO NOT TURN THE PAGE UNTIL THE TEACHER TELLS YOU TO.

#8

The following questions are for picture #8

1.

a. There are eight boys in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

2.

a. The man is the father of one of the boys.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

3.

a. The boys are at a birthday party.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

#8

4.

a. Some of the boys are wearing Cub Scout uniforms.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

5.

a. The boys have just come from a scout meeting.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

6.

a. One boy is swinging a pole.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

#8

7.

a. The people in the picture live in California.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

8.

a. The man is the scout leader.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

9.

a. There are some girls in the picture.

_____ true

_____ false

_____ I don't know

b. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

10\.

a\. The pole is just about to hit the piñata (paper animal).

_____ true

_____ false

_____ I don't know

b\. If you answered either "true" or "false," how sure are you that the answer you have given is correct?

_____ Very sure

_____ Pretty sure

_____ Not sure at all

STOP HERE! DO NOT TURN THE PAGE UNTIL THE TEACHER TELLS YOU TO.